80-184 Disagreeable Language: talk in the age of polarization
Intermittent: 9 units
What do you do when confronted with opinions that (to you) are obviously wrong - supported by facts that are not even based in (your) reality? This is a situation we more and more find ourselves facing, or would if we ever ventured out of our own ideological bubble (which is constantly replenished by Big Tech and only with information pre-matched to our biases). It is held in place by human language itself - our supposed primary means of communication. While it is true that pictures can lie -- one hundred years ago Arthur Conan Doyle got taken in by the Cottingley pixie photographs, and now there's CGI and Deepfake -- language has always been the premier instrument for the conveyance of untruths. And when the facts themselves are up for grabs, the traditional approach -- going outside of language for confirmation and fact-checking - doesn't work either. Can anything be done about this precarious situation? Disagreeable Language explores a possible solution -- through linguistics, the study of human language. A sub-field of linguistics is the study of language structure, an enterprise which is self-contained and relies on no information outside of language and speaker intuitions. But this independence from reality may make linguistics the right tool for the detection of reality. If patterns of untruth leave their mark in language itself, linguistic techniques would be the way to reveal them. That could provide an escape route out of the matrix. At the very least, students in this course will learn basic methods for interrogating the language we use to get through to one another, that is, basic methods for doing linguistics.

80-201 Knowledge and Justified Belief
Intermittent: 9 units
Knowledge acquisition is central to the university's mission. The sciences seek knowledge of nature. Statistics concerns methods for finding and establishing scientific knowledge. Machine learning concerns the automated generation of knowledge. Database theory concerns the maintenance of knowledge. But then what are knowledge, justified belief, truth, and evidence, and how do all of those concepts fit together? The branch of philosophy that studies those questions is called epistemology, which just means “study of knowledge”. This class confronts the central epistemological questions. Topics include the analysis of knowledge and justification (what are they?), skepticism (the justifiability of beliefs that goes beyond the data available), and the relationship between knowledge and deductive logic (are the consequences of knowledge knowable?). The proposed answers involve a subtle interplay of logic, probability, causation, and counterfactual reasoning. The course is self-contained, so there are no prerequisites.

80-208 Critical Thinking
Intermittent: 9 units
This course is an introduction to practical reasoning. The course will contain an elementary introduction to concepts important for reasoning and decision making, such as validity, probability, and utilities. Students will extensively practice critically analyzing and evaluating a wide variety of arguments found in newspapers, magazines, and elementary accounts of scientific reasoning. In order to help students develop the skills to analyze and evaluate arguments, the course will introduce several software packages recently developed at CMU that help students diagram arguments and causal reasoning; these packages have been shown to improve students critical reasoning skills. In addition, students will learn about a wide variety of statistical, logical, psychological, and causal fallacies that are used to mislead people.

80-210 Logic and Proofs
All Semesters: 9 units
Logic Proofs is a web-based course and introduces students to central issues in modern logic. It is designed for individual learning with rich interactive environments and dynamic intelligent tutoring. The material is presented on-line, and most exercises are done on-line as well. Readings of historical and philosophical character complement the core content. This on-line course is supplemented, indeed given additional grounding, by weekly meetings in very small groups. There, we have collaborative reviews, substantive discussions and critical reflections. The central question of the course is this: How can we analyze the structure of rational discourse or, more specifically, the logical structure of argumentation? An answer to this question requires: (i) uncovering the logical form of statements; (ii) defining the correctness of logical steps; (iii) formulating inference rules for the logical forms; (iv) designing strategies for argumentation with the inference rules. The course takes these steps for both sentential and quantificational logic.

80-211 Logic and Mathematical Inquiry
Intermittent: 9 units
Since ancient times, mathematical arguments have served as a paradigm for rational inquiry. This course studies the structure of such arguments and their applications. We will study foundational mathematical concepts and informal proofs, as they appear in everyday mathematics. At the same time, in parallel, we will study mathematical logic, which provides formal symbolic languages for mathematics. The course will make use of a computational “proof assistant” to develop fully rigorous, machine-checked proofs. This course prepares students to take the 310-311 series on the fundamental (in)completeness and (un)decidability theorems of modern logic.

80-212 Arguments and Logical Analysis
Intermittent: 9 units
Are there rational methods that can further our knowledge? The notion of rational inquiry presupposes that there are appropriate methods for the pursuit of knowledge. In this course, we will investigate the means by which a successful argument justifies its conclusion, as well as various subtle ways in which other arguments fail. The course will explore the use of logic as an argument in the study of arguments and reasoning, and it will serve as a gentle introduction to the elementary concepts of formal logic. We will take a historically informed approach to studying logic and argumentative fallacies, and we will discover that logical tools and methods are useful for constructing and analyzing arguments in all disciplines, from philosophy and history to psychology and physics. Our goals are to acquire a solid grasp of some fundamental tools of modern logic, and learn how to use them to make our thinking and writing clearer, more precise, and more critical. To this end, our coursework will consist in homework and exams on topics in logic, as well as writing assignments on a variety of topics. This course is intended for students from any discipline who would like to improve their writing and critical thinking skills, as well as students who are interested in learning logic without having had prior contact with the subject.

80-214 Computing, AI, and Philosophy
Intermittent: 9 units
The aim of the course is to give an interdisciplinary introduction to computation, artificial intelligence, and philosophical questions regarding it. It will also include historical and sociological issues concerning these topics as well as their representation in the arts. The course does not require a background in mathematics, computer science or philosophy.

80-220 Philosophy of Science
Intermittent: 9 units
In this course, we will examine some historical case studies (e.g., the Copernican revolution in astronomy) against which we will assess views pertaining to the significance, justification, and production of scientific knowledge. For example, should scientific theories be understood literally or as computational devices for deriving new predictions? How can we explain contribution to a theory's confirmation by the evidence? Does science aim to find the truth? Is probability in the world or only in our minds? Is explanation a matter of finding causes or are causes whatever it is that explains? Is scientific rationality objective or culture-relative?

80-221 Philosophy of Social Science
Spring: 9 units
This course will explore various philosophical issues germane to social science. The central question of the course asks whether we can use traditional scientific tools to understand social phenomena, e.g. wars and religions, in the same way that we use them to understand natural phenomena, e.g. gases, lasers and planetary orbits. Some of the more specific questions we address: Because humans possess free will and act with intentions while light rays and planets in motion do not, are we forced to use logically different species of explanations in the two cases? How can we explain social institutions that depend upon cooperation? Whereas natural scientists actively conduct experiments, social scientists can often only collect statistical data. Does this difference prevent social scientists from inferring causal relations? Is our understanding of social phenomena always value laden?

80-222 Measurement and Methodology
Spring: 9 units
This is intended as an introduction to the theory of measurement. How are units chosen? Under what conditions do qualitative relationships determine quantitative ones? We shall investigate theories of extensive measurement, with and without error. Applications will be taken from the natural and social sciences. Prerequisites: None specifically; however, students should have background in elementary logic and be comfortable with taking mathematical approaches to conceptual problems.
80-223 Causality and Probability
Intermittent: 9 units
This course will focus on the interplay between science, technology, medicine, on the one hand, and race gender on the other. Teaching us to use scientific methods to understand the nature of conflict and why it tends to escalate, and develop your own skills in negotiation simulations exercising your powers of communication and persuasion while practicing conflict resolution tactics. My goal is that you finish this course a more reflective and effective negotiator, better prepared to handle the conflicts you will inevitably face.

80-243 Ethics of Leadership
Intermittent: 9 units
From business operations to international affairs, leadership concerns the use of power or influence to coordinate a group towards common purpose. However, leadership also requires the acceptance of responsibilities not shared with the other group's members. Given their distinctive role and responsibilities, leaders must be prepared to face a unique host of moral problems and dilemmas. In this course, we will pursue the question of what makes a morally good leader, as opposed to a merely effective one. To that end, we will critically examine various competing theories of leadership while considering the moral challenges that arise when power, self-interest, justice, and the collective good collide.

80-224 Race, Gender and Science
Intermittent: 9 units
In this course, we will focus on the interaction between science, technology, and medicine, on the one hand, and race gender on the other. Taking up a series of controversial issues and cases from the past and the present, we will consider the implications for developers, technology, the life sciences for politics, social identity, and cultural belonging. In our readings and discussions, we will examine the roles of science, technology, and medicine in defining and redefining race and gender; the ways in which cultural beliefs about race and gender have influenced scientific research and the development of knowledge; and the efforts by individuals and social movements to challenge scientific institutions and assert new claims about identity, difference, and inequality.

80-226 Revolutions in Science
Intermittent: 9 units
Science is an ever-changing enterprise. Most scientific advances, though significant, occur within a stable framework of accepted theories and data. A few episodes of change in the history of science involve discarding and replacing fundamental theories of the world. These are often accompanied by significant changes in the vocabulary in which those theories are expressed, the tools used by scientists, the phenomena on which scientists focus, and the kinds of explanations they consider acceptable. A very small number of these episodes change the way humanity views its ability to know the natural world and its place in universe. The latter two kinds of change in science have often been called "scientific revolutions." We will focus on three such radical transformations: the "Copernican Revolution" (or "the Scientific Revolution") of the 16th and 17th centuries, the Darwinian revolution of the 19th century, and the quantum revolution of the late 19th and 20th centuries. This course has two intertwined components: history of science and philosophy of science. In the historical component, we will examine in some detail the three major scientific revolutions. The philosophical components will help us understand the reasoning involved in scientific theory change. This course does not require detailed knowledge of any of the sciences used in examples of revolutionary change.

80-241 Ethical Judgments in Professional Life
Intermittent: 9 units
This is a multimedia, hybrid course that examines the numerous ethical issues, problems and dilemmas that confront professionals in such areas as medicine, law, engineering, the media, government, and the natural and social sciences. As a hybrid course, it includes educational materials in video streaming format, an audio CD, an electronic discussion board and web-based "guided inquiries" that students navigate and complete. Topics discussed include: Responsibility in the professions, obligations to clients, conflicts of interest, Whistleblowing, codes of ethics and ethics in engineering, medicine, law, media, computer science and business among others. This course meets one day a week and employs a case study discussion format during class.

80-244 Environmental Ethics
Intermittent: 9 units
This course provides an introduction to core ethical issues in health care, medical research, and public policy. Topics include: the moral responsibilities of health care providers to patients and various third parties such as the government or insurance companies, the status of health as a social good, and questions of individual liberty and social responsibility at the ends of life including issues such as abortion, physician assisted suicide, and the definition of death. We will also examine specific ethical issues in the conduct of medical research and look at the impact of technological innovation on our notions of health, disease, life, death, and the family. If time permits, we may also discuss issues related to genetics and cloning. While the course engages such substantive ethical issues it also attempts to sharpen students' skills in practical reasoning through argument analysis, analogical reasoning, and the application of theory and principles to particular cases.

80-245 Medical Ethics
Fall: 9 units
This course provides an introduction to core ethical issues in health care, medical research, and public policy. Topics include: the moral responsibilities of health care providers to patients and various third parties such as the government or insurance companies, the status of health as a social good, and questions of individual liberty and social responsibility at the ends of life including issues such as abortion, physician assisted suicide, and the definition of death. We will also examine specific ethical issues in the conduct of medical research and look at the impact of technological innovation on our notions of health, disease, life, death, and the family. If time permits, we may also discuss issues related to genetics and cloning. While the course engages such substantive ethical issues it also attempts to sharpen students' skills in practical reasoning through argument analysis, analogical reasoning, and the application of theory and principles to particular cases.

80-246 Moral Psychology
Intermittent: 9 units
In this course you will read cutting-edge scientific work on morality and you will learn to interpret it in light of recent lessons from biology and computer science. This course will also introduce you to distinctions that philosophers have found useful for moral-psychological and meta-ethical theorizing. Topics that we may discuss include: the psychology of normative ethics; moral emotions (e.g., disgust, guilt, shame, pride, etc.); the origins of morality in human and nonhuman animals; moral development in babies and children; the role of moral judgment in folk theorizing; and mathematical models of morality inspired by insights from machine learning. However, this course is exploratory and designed to be open-ended. I hope and expect that students will help to determine what we read and discuss.

80-248 Engineering Ethics
Fall: 9 units
This course provides an introduction to core ethical issues in engineering research and practice. Topics include: the moral responsibilities of engineers to clients and various third parties such as the government or insurance companies, conflicts of interest, whistleblowing, codes of ethics, and the status of engineering projects as social goods. While the course engages such substantive ethical issues it also attempts to sharpen students' skills in practical reasoning through argument analysis, analogical reasoning, and the application of theory and principles to particular cases. This course meets two days a week and employs a case study discussion format during class.
80-249 AI, Society, and Humanity
Intermittent: 9 units
AI and robotic technologies are rapidly developing and spreading, with corresponding social and human impacts opportunities. Understanding these potential risks and benefits requires a multidisciplinary approach, drawing from ethics, philosophy, psychology, sociology, economics, and more. These diverse perspectives can help us to ensure that new technologies support and advance human and social values interests. In this course, we will study relevant disciplinary methods frameworks through a series of case studies of current or near-future AI and robotic technologies. We will learn to apply those techniques to analyze and understand the challenges opportunities presented by novel technology. [Note: This course has been significantly revised from previous versions of the course]

80-230 Ancient Philosophy
Intermittent: 9 units
This course will cover Ancient Greek philosophy from the pre-Socratics to the later Hellenistic writers. We will prepare the background for Socrates and Plato by studying major Presocratic philosophers such as the Milesians, Heraclitus, and Parmenides, and then dive in to a careful study of some of the central works of Plato and Aristotle. A key theme of the class will be the way in which Socrates, Plato, and Aristotle sought to define philosophy in opposition to sophistry, and how the lessons learned from their confrontation with sophistry informed their ethical and metaphysical thought. The final sections will discuss post-Aristotelian movements such as Epicureanism, Skepticism, and Stoicism.

80-251 Modern Philosophy
Intermittent: 9 units
This class will focus on the history of Western philosophy in the modern period, with special emphasis on the "early modern" era of roughly 1600-1800. Massive upheavals and conflicts in science, politics, and religion fueled attempts to find new ways of making sense of the world, and we will try to situate our philosophers within this rapidly evolving intellectual context. In particular, we will examine the impact of these changes on two subfields of philosophy: metaphysics (the study of the nature of reality, distinguishing it from mere appearance), and epistemology (roughly, the study of knowledge itself). We will ask, and attempt answers for, questions like: What is knowledge, can we achieve it, and if so, to what extent? To what extent, if any, can our most basic scientific instruments, the human senses, lead us to the true nature of the world? These questions will unavoidably send us down paths into other subfields, like philosophies of mind, of free will, of ethics, and of religion. After reading early modern philosophers like René Descartes, Princess Elizabeth of Bohemia, John Locke, David Hume, and Immanuel Kant, we will turn to some more recent work in the modern and contemporary eras to see what lessons (if any) were learned, and what new approaches (if any) have been taken in the quest for knowledge and reality.

80-252 Kant
Intermittent: 9 units
Immanuel Kant was a CMU sort of person. He was an enthusiastic follower of Isaac Newton, and his approach to fundamental philosophy was: "what would robotics be like from the viewpoint of the robot?" From that starting point, he investigated what would have to be the case for the robot to "nativism" vs. "empiricism" issues in contemporary cognitive science and information. During his life in the late 19th-century, Friedrich Nietzsche was a relatively obscure German philosopher. Since his death, however, he has become deeply influential and well-known, and was a source of inspiration for many important 20th-century thinkers. Despite this popularity, Nietzsche's philosophy remains relatively mysterious, and often misunderstood. Much of his writing consisted of aphorisms, rather than more traditional prose and arguments, and many of his positions seem to contradict one another. This course will cover a broad range of Nietzsche's writings, focusing on such central concepts as the will to power, eternal recurrence, and the oft-misunderstood Ubermensch ("overman"). Throughout, we will focus on developing a consistent interpretation of an enigmatic philosopher whose views have been mischaracterized and misappropriated throughout the past century.

80-254 Analytic Philosophy
Intermittent: 9 units
This course examines the revolutionary impact of philosophy at the turn of the 20th century on contemporary thought and progress. By the 1920s some scientists and philosophers became hopeful that the end of the long tradition of philosophical deadlock was finally within reach. Buoyed in particular by Einstein's theory of relativity and the invention of modern logic, they created a new kind of philosophy with the goal of applying logical and empirical methods to philosophical problems. This new approach led to new puzzles and paradoxes, along with a focus on the age old question of what can be known and what is meaningful. The modern fields of linguistics, cognitive science, and information and computer sciences all owe a debt to these sources, as does of course contemporary philosophy. Our quest will be to understand both what authors like Frege, Russell, and the Vienna Circle were up to in the first place, and how their work contributed to the world we live in today.

80-255 Pragmatism
Intermittent: 9 units
American Pragmatism represents an energetic attempt to bridge the divergent cultures of science and the humanities. The movement's founder, C.S. Peirce, was trained in chemistry and worked as a physicist, but he was also deeply concerned with the contemporary philosophical portrayal of science, which distinguished sharply between theoretical knowledge and practice. Peirce responded by constructing a comprehensive philosophy emphasizing the scientific importance of community, fallibility, and action. Pragmatism was also developed and vigorously popularized by William James, who aspired to be a painter and ended up as an acknowledged founder of modern empirical psychology. James extended Peirce's position by defending the role of values in even the purest of empirical sciences. John Dewey, who is also well-known for his role in education, interpreted science as an evolving social system and developed a theory of aesthetics based on what we now call the psychology of problem solving. The pragmatists made and continue to make lasting contributions to modern statistics, logic, and social science and their emphases on community, fallibility, action, and value in science are still of primary importance in philosophy and in the ongoing dialogue between the scientific and humanistic cultures.

80-256 Modern Moral Philosophy
Intermittent: 9 units
This course will follow moral theory through the modern era (roughly 1600-1900), with special emphasis on the works of Hobbes, Hume, and Kant, as well as the development of utilitarianism. Since moral theorizing was only one part of these thinkers larger systems of philosophy, it cannot be fully separated from questions of metaphysics and epistemology (e.g., free will, determinism, materialism, etc.), and we'll spend some time situating their ethical thought within their larger projects. In doing so, we'll also examine these theories within the context of the rapidly changing social, political, and scientific landscape of the modern period.

80-257 Nietzsche
Intermittent: 9 units
During his life in the late 19th-century, Friedrich Nietzsche was a relatively obscure German philosopher. Since his death, however, he has become deeply influential and well-known, and was a source of inspiration for many important 20th-century thinkers. Despite this popularity, Nietzsche's philosophy remains relatively mysterious, and often misunderstood. Much of his writing consisted of aphorisms, rather than more traditional prose and arguments, and many of his positions seem to contradict one another. This course will cover a broad range of Nietzsche's writings, focusing on such central concepts as the will to power, eternal recurrence, and the oft-misunderstood Ubermensch ("overman"). Throughout, we will focus on developing a consistent interpretation of an enigmatic philosopher whose views have been mischaracterized and misappropriated throughout the past century.

80-261 Experience, Reason, and Truth
Intermittent: 9 units
A central issue in Western philosophy has been whether reason or experience (or some of both!) provides the foundations for human knowledge. This course explores that question by looking at various "empiricist" vs. "rationalist" debates from the 17th century to the present day. We will focus on the problems encountered in trying to give an adequate account of the our knowledge of the external world, the structure of our minds, and the nature and limitations of human knowledge. The scope of our investigation will extend to the nature of mathematical knowledge, to "thought experiments" in both science and philosophy, and to "nativism" vs. "empiricism" issues in contemporary cognitive science and moral theory. The course has two main goals: (1) to study key metaphysical and epistemological issues surrounding the nature of human knowledge and (2) to help improve our analytical and critical skills by extracting and evaluating various relevant philosophical arguments.
80-263 Approaching Chinese Philosophy: Basic Texts and Implications
Intermittent: 9 units
This course focuses on ancient texts of Chinese philosophy, which have had a foundational role in Chinese society and culture. We will look at original texts from the Chinese classics, including the I Ching (Book of Changes) and the Tao Te Ching (basic treatise on Taoism). We will consider the role and place of science and explanation in Chinese society. We will also discuss the difficulty of translation from one language to another or from the writings of one era into another. The course will seek to connect the ancient literature and practice with modern perspectives on science, metaphysics, mind/body dualism, and causation. We will take the ancient texts in their original form as points of departure for our exploration. No prior knowledge of the Chinese language is assumed. The course is relevant for cultural and language studies, as well as studies in history and philosophy of science.

80-270 Problems of Mind and Body: Meaning and Doing
Intermittent: 9 units
Central to our existence is meaning and our responses to it. We believe and desire things and on the basis of these attitudes, we make things happen. How can meaning exist in a seemingly mindless world? How can the world give rise to a mind capable of agency? This course tackles the mind body problem in respect of explaining meaning and human action. We tackle philosophical problems with serious engagement with empirical work from psychology and neuroscience. Students taking the course will tackle these problems with emphasis on developing analytical abilities.

80-271 Mind and Body: The Objective and the Subjective
Intermittent: 9 units
This course has two parts. First, we will look at basic concepts used in psychology (and cognitive science broadly) through the lens of philosophy including: representation, computation, information, explanation, modularity, attention, automaticity and control. Having some concrete proposals about these ideas will allow us to formulate psychological claims more concretely. Second, we will reverse course and look at traditional philosophical problems through the lens of psychology focusing on three topics: consciousness, agency, and perception. Specifically: what is consciousness, what is it to be an agent, what is it to perceive?

80-275 Metaphysics
Intermittent: 9 units
The topical agenda of this course will vary. Typical topics include the problem of personal identity, the nature of human freedom, the nature of the self, the nature of reality and being, the nature of causality, and the question of whether solutions to such problems can be given. Classical as well as contemporary philosophic texts will be studied. For Spring 2011: Issues we will consider, in no particular order, include: Do properties exist? What should you think about the identity of things through time? What is the number of a number? Why should you think other people have mental states? What are natural kinds? What constitutes the identity of things through time? What constitutes the identity of persons through time? What does determinism mean? Is there freedom of the will? What is possibility? What is necessity? Are there other possible worlds? When does one event cause another, and what does that mean? What could a deity be, and should you think there is one?

80-276 Philosophy of Religion
Intermittent: 9 units
While many interesting questions about religion are belief-specific, we will strive in this course to keep a global perspective. We will begin by considering a concept at the center of Western religion – God – as it presents itself in various traditions. We will then move to consider major Eastern religions, with a focus on their influence on philosophical thought. In both of these studies, we will emphasize the relationship between language and religion. We will conclude the course by considering commonalities between Eastern and Western religious thought. The student should leave the course with 1) the tools to consider religious text and rhetoric philosophically, and 2) a sharpened idea of what ‘religion’ is (though this might differ from my own!).

80-280 Linguistic Analysis
Intermittent: 9 units
At one level, language is constituted by nothing but sounds, or marks on paper. How can such physical objects be used to create or transmit meaning? The answer assumed in this course is that objects with specific physical features are assigned symbolic or linguistic values on the basis of those features. By the juxtaposition of such objects (phonemes or graphemes), larger symbolic objects are created (morphemes). Morphemes have the special property that they can be associated in a consistent way with meanings. In a progressive fashion, words are built from morphemes, phrases from words, and sentences from phrases. Sentences have different moods, and these moods correspond to their function with respect to the encoding and transmission of information. Indicative sentences carry information, interrogative sentences request information, imperative sentences demand action, conditional and modal sentences present alternative possibilities, and so on. The goal of this course is to investigate the structure of the linguistic entities by which these communicative functions are realized. Building on material taught in Nature of Language, we look in detail at the morphology and syntax of human languages, paying special attention to cross-linguistic variety.

Prerequisite: 80-180

80-281 Language and Thought
Intermittent: 9 units
The goal of this course is to provide students with the opportunity to creatively explore some difficult questions about the relationship between language and thought, questions such as: How does the human capacity to use language relate to the human capacity to think? Does the language that a person speaks affect the way she thinks? If meaning is in the head, how can we succeed in communicating with each other? How is our ability to reason related to our ability to successfully communicate? None of these questions have definite answers; throughout the course, we will draw on work in philosophy, psychology and linguistics to try to understand some of the possible answers that might be entertained. Students in the course should be prepared for extensive reading, writing and peer discussion assignments.

80-282 Phonetics and Phonology I
Fall: 9 units
This course aims to provide students with practical tools for the study of speech sounds. The acoustic properties of sounds are examined using spectrograms and other devices, with emphasis on vowels and sonorant consonants. Following this, basic phonological notions are covered, tracing their development in the twentieth century up through optimality theory. In optimality theory, contrast and allophonic variation are explained in terms of an input-output device which selects the most harmonic candidate still faithful to phonemes in the input. The course should be relevant not only to linguistics students, but to students of language generally, with applications to sociolinguistics, child language development, speech recognition technologies, and the study of foreign languages.

Prerequisite: 80-180

80-283 It Matters How You Say It
Intermittent: 9 units
Why do languages give us multiple ways to say the same thing? Given that in English we can say “My dog ate my homework,” why do we sometimes prefer “My homework got eaten by my dog”? Why do we sometimes choose to refer to someone with just a pronoun (“he”), and sometimes choose their full name (“Charles Dickens”)? What’s the difference between telling someone: “This expensive coffee is tasteless,” or telling them: “This tasteless coffee was expensive”? This course is about the choices that languages give us for conveying a particular message, and the communicative effects of those choices. We will see that it is both the words you use and the way you put them together that determines the total communicative effect of your utterance. While the course will focus on English, students will have an opportunity to work on another language of interest in their final project.
80-284 Invented Languages
Intermittent: 9 units
Language is normally something that develops and changes organically within human communities, without much in the way of organized design or invention. However, many have succumbed to what J. R. R. Tolkien called the "secret vice" of language creation. The study of invented languages has been diverse. Some, like Tolkien's Elvish languages, Okrand's Klingon, and Peterson's Dothaki and Trigedasleng have been designed for artistic or entertainment purposes: they have set out to be "natural" languages within fictional worlds. Others, like Zamenhof's Esperanto, Brown's Loglan, and Elgin's Láadan have tried to address perceived inadequacies of the natural languages that their creators saw in the world around them. The study of language invention is thus both the study of a distinctive art form, and an exploration of the history of the experience of language is full of direct and indirect evidence of language invention and the linguistic lessons of the history of invented languages, with a particular emphasis on applying these insights to our own language invention projects. Over the course of the semester, students will be expected to develop their own languages, and to complete various shorter assignments to supplement relevant ideas and skills. This course does not assume any background in linguistics, and is intended to accommodate both newcomers and advanced students.

80-285 Natural Language Syntax
Intermittent: 9 units
This course is intended to provide an introduction to the methods of syntactic analysis and the study of syntactic structure. A primary theme of the course is the notion of syntactic constituency: how can we tell if a language treats a given sequence of words as single grammatical unit? Do all aspects of syntax manipulate the same kinds of structural units? How do other syntactic relations connect with constituent structure? To the extent that there is mismatch between different notions of syntactic structure, can it be reconciled within a theory of grammar? These questions are engaged in through the techniques of modern syntactic analysis and argumentation. Those tools will allow us to explore the striking ways in which syntactic theory unifies diverse grammatical phenomena in terms of a common notion of phrase structure. The course complements 80280, Linguistic Analysis, building on but not presupposing syntactic analyses developed in that class. Prerequisites: 80-180 or 80-284

80-286 Words and Word Formation: Introduction to Morphology
Intermittent: 9 units
How many words do you know? Is 'gonna' one word or two? How many meanings does 'unlockable' have? If someone can be 'inept', why can't they be 'ept'? In this course we study the linguistics of words and word formation, known as morphology. We begin by asking what a word is, about the internal structure of words, and how new words are formed. Throughout, we will consider these questions from a cross-linguistic perspective, looking at morphological data from a wide range of languages. We will also consider how morphological influences on other subfields of linguistics, including phonology, syntax and semantics. Finally, we will survey morphological questions from the perspectives of language acquisition, psychology, and cognitive science. Prerequisites: 80-180

80-287 Language Variation and Change
Intermittent: 9 units
This course explores language variation across space and time. Our experience of language is full of direct and indirect evidence of language change and variation, and of the ways that these interact and intersect with other historical and social phenomena. How do languages change over time, and what kinds of factors influence this change? How do we determine whether, say, Farsi and Nepali (or Farsi and English) were at some point in the past the same language, before different changes took them in different directions? If they are, how do we investigate what that past language might have sounded like? What are the sources of variation within and between languages, and how can we investigate the nature of this variation? How can an understanding of language change help us to make sense of language variation, and how can an understanding of language variation help us to make sense of linguistic change? How do issues of language and social status and political power affect language variation and change? What happens when languages come into contact? How can linguistic theory inform the study of variation and change, and what insights can the study of these phenomena provide into linguistic theory? This course is intended to provide students with the tools to begin to explore and address these kinds of questions. Prerequisite: 80-180

80-288 Intonation: Transcription and Analysis
Intermittent: 9 units
Intonation is the melody of speech: how a speaker's pitch changes over the course of an utterance, along with the placement of emphasis, or sentence-level stress. Intonation and stress contribute to the interpretation of utterances in multiple ways. For example, the questions "Did BOB go to the store?" and "Did Bob go to the STORE?" contain the same words, but request different information. Similarly, whether the sentence "Bob went to the store" is interpreted as a statement or as a question, the question mark as expressing certainty or uncertainty on the part of the speaker, depends on its intonation. Features of intonation can also convey information about the speaker's attitudes and affect: sarcasm and irony, for example, may be signaled by intonation. The goal of this course is two-fold. First, students will learn about the phonetic correlates of intonation and stress, and learn how to analyze intonation as a system of high and low tones, using the intonation transcription system ToBI. This will enable students to accurately describe the intonation pattern of an utterance. Second, students will learn how intonation is used to convey semantic and pragmatic information. The course will focus primarily on English, but other languages will be explored to serve as a basis of comparison. The course will be of interest to students interested in learning some of the intricacies of face-to-face linguistic communication. Students in the departments of English, Modern Languages, Language Technology, Human-Computer Interaction, and Psychology will find material relevant to their major topics. The course serves as an elective for the Linguistics Major, and is a natural companion to other courses on the expression of linguistic meaning: Meaning in Language, Language in Use, and Syntax and Discourse. The course requires basic background in phonetics. Prerequisites: 80-284 or 85-356 or 80-488 or 85-385 or 80-180

80-292 Learning Science Principles
Spring: 12 units
The ability to learn - that is, to change and adapt to one's environment - is one of the hallmarks of intelligence, whether in humans, animals, or machines. In this course, we will examine the nature, components, and significance of learning in many different manifestations, with a particular focus on the fundamental concepts that underlie the ways in which we understand the concept of learning in different disciplines. This course will thus focus more on concepts and foundations, rather than technical aspects of learning, whether mathematical, experimental, or computational. This course will be almost entirely project-based: you will work in groups (with students from different backgrounds) to identify opportunities for learning media, and then develop designs that appropriately address those opportunities. In the course of developing these media designs, you will learn, and come to understand, concepts and principles of learning from different disciplines. The emphasis throughout will be on careful conceptualization, description, and design of the learning through and about media. This course will work in tandem with 05-292 Learning Media Methods. To waive an IDEATe portal course requirement, students should have prior project-based coursework in design, social science research methods, or interactive prototyping experience.

80-294 Ethics Internship
Fall and Spring: 9 units
The Ethics Internship is for the Department of Philosophy designed with ethics minors in mind.

80-296 Impacts of AI: AI and Intelligence
Fall and Spring: 3 units
AI and robotic technologies are rapidly developing and spreading, with corresponding social and human impacts. In this course, we will consider the impacts of AI and ethical issues of advancing technologies. This Micro course will run between 5-6 weeks. The instructor will fly into Doha for a short period of face-to-face classes, centered around a Saturday. Enrolled students should expect two 90-minute face-to-face classes during the week before or after this Saturday date, as well as four 90-minute evening (6-7:30 pm) video classes over the duration of the Micro course (typically two before the campus visit, and two after, although instructors can change this). Specific dates will be confirmed in the syllabus closer to fall semester.

80-297 Ethics Internship
Fall and Spring: 3 units
AI and robotic technologies are rapidly developing and spreading, with corresponding social and human impacts. In this course, we will consider the impacts of AI and ethical issues of advancing technologies. This Micro course will run between 5-6 weeks. The instructor will fly into Doha for a short period of face-to-face classes, centered around a Saturday. Enrolled students should expect two 90-minute face-to-face classes during the week before or after this Saturday date, as well as four 90-minute evening (6-7:30 pm) video classes over the duration of the Micro course (typically two before the campus visit, and two after, although instructors can change this). Specific dates will be confirmed in the syllabus closer to fall semester.
80-298 Impacts of AI: AI and Society
Fall and Spring: 3 units
AI and robotic technologies are rapidly developing and spreading, with corresponding social and human impacts opportunities. In this course, we will consider the societal impacts of AI. This Micro course will run between 5-6 weeks. The instructor will fly into Doha for a short period of face-to-face classes, centered around a Saturday. Enrolled students should expect two 90-minute face-to-face classes during the week before or after this Saturday date, as well as four 90-minute evening (6-7:30 pm) video classes over the duration of the Micro course (typically two before the campus visit, and two after, although instructors can change this). Specific dates will be confirmed in the syllabus closer to fall semester.

80-305 Decision Theory
Intermittent: 9 units
This course is an introduction to formal models of choice and decision-making. We begin by examining choice under certainty, developing both qualitative and quantitative models of preference. We then expand our analysis to take into account uncertainty, focusing on the von Neumann-Morgenstern theory of expected utility and Savage's classic axioms. Empirical challenges to models are emphasized throughout, in response to which we will consider a variety of alternative representations of uncertainty (e.g., Dempster-Shafer belief functions, non-unique probability measures) and preference (e.g., framing effects, prospect theory).

80-310 Formal Logic
Fall: 9 units
Among the most significant developments in modern logic is the formal analysis of the notions of provability and logical consequence for the logic of relations and quantification, known as first-order logic. These notions are related by the soundness and completeness theorems: a logical formula is provable if and only if it is true under every interpretation. This course provides a formal specification of the syntax and semantics of first-order logic and then proves the soundness and completeness theorems. Other topics may include: basic model theory, intuitionistic, modal, and higher-order logics.

80-311 Undecidability and Incompleteness
Spring: 9 units
U I focuses on two fundamental results: the undecidability of logic (established by Alonzo Church and Alan Turing) and the incompleteness of mathematical theories (discovered by Kurt Gödel). The proofs of these results require a novel metamathematical perspective, but also striking logical concepts and fascinating mathematical techniques. In this course, the theorems are not just formulated but actually proved. We begin with the axiomatic development of elementary set theory that allows, at the same time, the formal representation of informal mathematics like number theory. With this basis, one can show that syntactic notions concerning set theory are representable in the very theory. It is then easy to prove that set theory is incomplete. To show that logic is undecidable, the crucial concept of computation is introduced via Turing machines. The two concepts - proof and computation - are fundamental for mathematics, computer science and, in particular, artificial intelligence. The undecidability and incompleteness results are among the most significant contributions of modern logic to the foundations of mathematics. They provide also the beginnings of a deeper understanding of mental processes in cognitive science and, thus, of the human mind. To understand the latter connections, we will read about and discuss historical as well as philosophical aspects of the subject.

80-312 Mathematical Revolutions
Intermittent: 9 units
Mathematics is a central part of our intellectual experience. It is connected to sophisticated philosophical perspectives, say, in the work of Plato, Descartes, Leibniz, Kant, as well as in contemporary analytic philosophy: it is equally connected to fundamental views in the sciences, say, in the work of Ptolemy, Galileo, Newton, Einstein, as well as in contemporary cosmology. The common view that mathematics - if not directly “static”, is evolving - is a linear fashion - does not withstand historical scrutiny. Indeed, there are many dramatic conceptual changes concerning the very nature and object of mathematics. We examine three episodes in the relatively recent past that reflect radical transformations of the subject. They are closely associated with three mathematicians in whose work those revolutionary changes come to the fore most poignantly. The three episodes are framed by a discussion, at the beginning, of the axiomatic method and, at the end, of contemporary computational models of mathematical thinking. The episodes fall within the period from 1854 to 1954, but have deep roots in the past. The first episode deals with the shift from geometry to arithmetic as the foundational discipline for mathematics. The accompanying change in the methodological perspective is expressed in Hilbert’s Foundations of Geometry, the center of the second episode. When joined with contemporaneous logical developments, that perspective underlies the formalization of mathematics. Gödel’s incompleteness theorems imposed theoretical limits on that work. However, given Turing’s analysis of computations, the question remains, how much of mathematical reasoning can be accomplished by computing machines. Completing a full circle, we incorporate central features of the axiomatic method into computational models of mathematical thinking.

80-314 Causal Discovery, Statistics, and Machine Learning
Intermittent: 9 units
Statistics and Machine Learning have made tremendous strides in recent years in solving a wide variety of regression and classification problems. However, causal discovery problems (i.e. discovery of which variables are affected by a given variable that undergoes change due to an external intervention, either man-made or natural, and to what extent other variables are affected by such a change) are distinct and more difficult problems. Causal discovery problems arise not only in scientific contexts (e.g. discovering which genes regulate which other genes) but also in some machine learning contexts (e.g. transfer learning problems). This course will (i) describe how causal discovery problems differs from regression and classification problems in goals, methods, and fundamental assumptions, (ii) describe recent advances in modifying machine learning and statistical algorithms to deal with causal discovery problems involving such difficulties as latent confounders, measurement error, selection bias, etc., and (iii) what the outstanding problems in causal discovery are and future directions the field might take. Students should have taken at least one course in statistics or machine learning, or obtain the permission of the instructor.

80-315 Modal Logic
Fall: 9 units
Standard logical languages allow you to express negations, conjunctions, (material) conditionals, maybe quantification, etc. But they can’t directly capture statements like the following: “Alice knows p.” “Henceforth, it will be the case that p.” “It ought to be the case that p.” “If it had been the case that p, it would have been the case that q.” “Everybody knows p.” “Everybody knows that everybody knows p.” “Infinitely often in the future, p will be true.” “After an announcement of p, it will be the case that Alice knows q.” “If p is not permitted, then you ought to know that p is not permitted.” etc. Modal logic is a very general approach for systematically reasoning about statements like these. This course is an introduction to mathematical modal logic and its applications in philosophy, computer science, linguistics, and economics, with emphasis on epistemic interpretations (i.e., for representing and reasoning about knowledge/belief). We begin with a rigorous development of propositional modal logic: the basic language, interpretation in relational structures, axiom systems, proofs, and validity. We prove soundness and completeness of various systems using the canonical model method and study model equivalence and expressivity results. We also consider topological semantics as an alternative to relational semantics, and investigate the connection between the two. In the latter part of the course we turn our attention to more specialized logics and their applications, as determined by the interests of the class. Topics may include: quantified modal logic, multi-agent systems and the notion of common knowledge (with applications to game theory), temporal and dynamic logics for (non)deterministic program execution, logics for reasoning about counterfactuals, public announcement logic, deontic logic, intuitionistic logic, and others.

Prerequisites: 21-128 or 80-212 or 15-251 or 21-127 or 80-211 or 80-210
80-316 Logic and AI
Intermittent: 9 units
In this course, we will study logical systems that are relevant to, and motivated by, research in artificial intelligence. We will see how key ideas and advances in logic have found (and continue to find) natural applications in AI. More generally, we will see how logic and AI can benefit, and historically have benefited, from each other. A central aim of this course is to understand how logical languages of varying expressive power can be put to use in AI, as a tool for representation and reasoning. Some of the topics that we will be focusing on are (1) non-monotonic and default logics, (2) modal logics for reasoning about knowledge/belief, temporal structures, and computation, (3) probabilistic logics (and the relation between logic and probability), (4) logics of graphical causal models and counterfactuals, as well as (5) elements of probabilistic programming and computable probability theory.
Prerequisites: 80-610 or 80-310

80-317 Introduction to Ramsey Theory
Intermittent: 6 units
While working on the decision problem for first order logic, Frank Ramsey [1930] developed a combinatorial approach that now bears his name. For one example of his idea, imagine that we construct an undirected graph on K-many nodes, connecting each pair of nodes with edges of one of two colors, red or blue. How many nodes K,2 does it take to insure that, no matter how we color the graph, there will be a trio of points each connected by the same color? How large do we need to make K to guarantee a homogeneous subgraph of 3 nodes in 2 colors? K = 5 will not do, as this picture reveals. See image here: https://goo.gl/xsg9S A 2-coloring of 5 nodes with no homogeneous subgraph of 3 nodes. In this introduction we will consider some of the fundamental theorems of Ramsey Theory and a family of applications to logic, graph theory, number theory, and ergodic theory.

80-321 Causation, Law, and Social Policy
Intermittent: 9 units
Policy makers face causal questions. For example, does violence on TV cause violence in life, and if so, what policies can we institute that will actually curb it? Does the death penalty actually deter criminals? Do tough drug laws reduce drug use? This course investigates how scientists establish causal claims, and how policy makers and the courts rely on or systematically ignore such science. We examine what causal claims mean and how they connect to statistical data, and we discuss the limits of standard techniques for establishing causal claims. We will consider all of these issues first theoretically, and then in the context of several case studies chosen mostly by the students.
Prerequisites: 36-201 or 36-200

80-322 Philosophy of Physics
Intermittent: 9 units
Philosophical problems in the development of modern physics. Topics include the philosophical significance of Einstein’s theory of relativity, interpretations of quantum mechanics, and the relationship between these two theories. Other topics may include the philosophy of space and time, the epistemology of geometry, the significance of modern cosmology, and chaos theory.

80-323 Philosophy of Biology
Intermittent: 9 units
This course will examine a range of foundational problems in evolutionary biology, as well as the implications of evolutionary biology for some basic topics in philosophy. Issues to be discussed include the meanings and roles of a variety of central concepts (such as species, fitness, function and adaptation) and controversies over adaptationism, genetic information, units of selection and the evolutionary explanation of human behavior. This course will be accessible both to philosophers interested in the epistemological and metaphysical status of evolutionary biology, and to biologists interested in better understanding the foundations of their field. Although there are no formal prerequisites for this course, students will be expected to have taken courses in either philosophy or biology.

80-324 Philosophy of Economics
Intermittent: 9 units
The science of economics has come to occupy a central position in contemporary society. Because of this central position in political decision making, economics is intertwined with a number of other philosophical issues surrounding justice, rights, and fairness. The central theme of this course will be on the arguments in favor and against markets as effective solutions to political problems. This issue will allow us to analyze a wide number of foundational issues in economics including the testability of economic claims, the implications of the “rationality” postulates, the foundations of the right to property, and measuring the success or failure of an economy.

80-325 Foundations of Causation and Machine Learning
All Semesters: 9 units
How can we define causality? Does smoking cause cancer? Can one find causality from observational data without temporal information? In our daily life and science, people often attempt to answer such causal questions for the purpose of understanding, proper manipulation of systems, and robust prediction under interventions. In the past decades, interesting advances were made in machine learning, philosophy, statistics, and economics for tackling long-standing causality problems, and a number of researchers have been recognized with the Turing Award (to Pearl in 2012) the Nobel Prize (to Granger in 2003 and to Sims in 2011). This course is primarily concerned with historical and technical developments of modern causality research, focusing particularly on how to discover causality from observational data and how to infer the causal effect of one variable on another. Thinking more broadly, causal analysis is a particular branch of unsupervised multivariate analysis. Accordingly, this course also provides a big picture of the foundations of causation and unsupervised machine learning. We start with unsupervised learning and multivariate statistical analysis problems including factor analysis, principal component analysis, and independent component analysis, and formulate their assumptions, develop their solutions, and study their connections with causal analysis. Finally, we investigate how the causal perspective helps in solving advanced machine learning or artificial intelligence problems, including transfer learning, image-to-image translation, reinforcement learning, and unsupervised deep learning.

80-326 Epistemology of Machine Learning
Intermittent: 9 units
Learning is hard! Programming a computer is also hard. Better that computers learn on their own from data how best to serve us. That is the goal of machine learning (ML), which is arguably the most successful branch of artificial intelligence. The very idea raises some natural, fundamental questions. What, exactly, is the goal of learning? Is it maintenance of consistency among our beliefs (Bayesian statistics), or is it a matter of estimating or predicting quantities in nature (frequentist statistics)? Is the goal prediction or truth; control or understanding; actual fact or necessary causal relations? Are predictions expected to be reliable beyond the narrow circumstances of training? Can learning be guaranteed to succeed by a specified time? Does success entail some detectable mark or sign of success that can be used to terminate the learning procedure? What roles do causality and simplicity play in learning, and how? Those questions arise spontaneously for the reflective ML researcher, but they also cross over into the foundations of statistics, the philosophy of science, and epistemology, the traditional philosophical study of the nature of knowledge and justified belief. This class provides an introduction to the relevant philosophical foundational issues underlying ML research. It involves both philosophical reflection and exercises providing concrete experience with ML methods. A unifying theme is that strong definitions of successful learning imply correspondingly strong limits on what can be learned.

80-327 Philosophy of Neuroscience
Intermittent: 9 units
400 years ago Rene Descartes claimed that the body is a machine manipulated via the pineal gland by a thinking soul with free will. At about the same time, Thomas Hobbes claimed the mind is the product of the brain, and the brain is a calculating device. Most of Descartes’ view enters to this day in popular belief, but something more like Hobbes opinion has come to dominate science. This historical part of the course will contrast Descartes The Passions of the Soul, with the contemporary scientific view of mind and brain in Patricia Churchlands Touching a Nerve. The course will describe the vision of a materialist, deterministic physiology of mind developed by Helmholtz, Freud and others in the 19th century, and opposition by the most influential psychologist of the time, William James. The main focus of the course will turn on how that scientific perspective has developed in classical and contemporary neuropsychology; on how new kinds of measurement of brain activities do or do not provide understanding of the mechanisms of thought and emotion; on how theories of mental functioning are argued for (or against); and on ethical issues posed by the advance of neuroscience. No philosophical background will be assumed of students. A previous course in neuroscience would be helpful, but is not required.
80-330 Ethical Theory
Spring: 9 units
Every day, even in very subtle ways, we make judgments of value that
shape our lives and our conduct. This course will examine four influential
attempts at providing a systematic account of the source and nature of
moral value, its relationship to other kinds of value, and the practical
implications of different answers to these questions. This focus on the
fundamental structure of moral value will frequently engage topics such as
the nature of the good, subjectivist and objectivist accounts of value,
forms of moral naturalism verses attempts at moral constructivism, and
will draw on historical as well as more contemporary sources. Particular
attention will be paid to articulating the specific sources of disagreement
that distinguish competing moral theories in order to facilitate our ability to
adjudicate between them on a reasoned basis.

80-335 Social and Political Philosophy
Intermittent: 9 units
Broadly speaking, political philosophers are interested in whether, and to
what extent, government use of coercion can be justified, and how social
and political institutions should be structured in order to be legitimate. This
is an advanced course in social and political philosophy, aimed at providing
students with a more in-depth familiarity with classic and contemporary
questions both theoretical and applied. The course is topical, and course
topics will vary from year to year. Typically 4-5 topics are covered in a
term. Previous years’ topics have included the nature and value of freedom,
social contract theory, racial and epistemic injustice and the nature of white
ignorance, the intersecting concepts of justice and equality, structural
injustice, responsibility for injustice, and immigration. Students are expected
to come away from the course with a strong understanding of some of the
major debates in social and political theory as well as the tools to analyze
ongoing debates within contemporary US and global politics regarding the
appropriate way to organize our social and political reality. This course is
primarily conducted as a seminar and is discussion–rather than lecture-
based.

80-336 Philosophy of Law
Intermittent: 9 units
In recent years, the U.S. legal system has been beset by claims of
overcriminalization, racially discriminatory enforcement, and inadequate or
unequal protection of individual civil rights. What should we make of these
claims, and what, if anything, would be implied by their truth? In seeking
to answer these questions, this course will examine the nature of the law
and its enforcement. We will begin by discussing the issue of criminalization
and whether the expansion of the criminal law is or is not problematic. From
there, we will turn to the more foundational questions of what, precisely, the
law is, and what its connection to morality is or should be. Are we obligated
to obey the law, and if so, why? Finally, we will ask whether it is possible
for a law to remain neutral with regards to morality and politics, and whether
the supposed “neutrality” of the law may itself be an instrument of
oppression. If the legal system lacks the kind of neutrality that many legal
theorists claim for it, what (if anything) does that license us (as citizens) to
do?

80-341 Computers, Society and Ethics
Intermittent: 9 units
This course explores many of the social and ethical issues that have
emerged in the wake of the significant advances that we have witnessed
in computer science and information technology (IT). Computers and
communications technologies have had an increasing impact on the whole
of society and have raised new and difficult ethical questions. In turn, these
ethical issues have spurred the need for a consideration of new policies
and regulations. In this new world of IT, some are concerned about the
protection of their privacy while others find problems of censorship and,
more generally, restrictions on information access to be their main focus as
a problematic social issue. This course will address these and other issues
such as: questions of free speech, surveillance in the workplace, intellectual
property and copyright, information acquisition and ethics and the Internet.

80-344 Management, Environment, and Ethics
Intermittent: 9 units
This course examines and poses answers to the following question: “What
are the legitimate environmental responsibilities of organizational managers
from the private, public and nonprofit sectors and how can they be best
fulfilled?” This query will provide the course with its major theme and
framework. But in order to do justice to it, three interrelated areas that
are presupposed by this question will need to be explored first. These
areas are (1) management ethics, (2) environmental ethics, and (3) environmental
ethics. The first half of the course will concentrate upon these three
areas. The second half of the course will focus upon management and
the environment employing the insights gained during the first half.
Here students will review past and current management practices with respect to
the environment, organizational policies dealing with the environment and the role of government in the process of
determining environmental responsibilities in management. Environmental
concerns on the international level and their impact upon organizational
management, the emergence of the "environmental affairs manager”
within organizations, balancing environmental responsibilities with other
management responsibilities and examples of management responses to
the environmental crises will also be examined during this portion of the
course.

80-348 Health, Human Rights, and International Development
Fall: 9 units
Approximately 767 million people, or more than 10% of the world’s
population, live in a condition the World Bank refers to as "extreme
poverty". Those who live in extreme poverty frequently lack effective access
to proper nutrition, adequate shelter, safe drinking water, and sanitation.
As a result, they also bear the greatest burdens of famine and epidemic
disease and frequently face social and political conditions of unrest and
systematic oppression. This course aims to introduce students to the
problem of global public health and its intersection with claims of human
rights. We will focus on theoretical accounts of human rights and questions
arising from them: What constitutes a human right, and on what basis or
bases might the existence of human rights be defended? If human rights
exist, whose responsibility is it to see that they are defended/provided/not
violated, and why? What is the relationship between health deficits and
human rights deficits, and what would a “human right to health” look like?
Are global institutions such as the protection of strong intellectual property
rights consistent with respect for a human right to health?

80-358 Hume
Intermittent: 9 units
This course will investigate the philosophy of David Hume. We will focus on
Hume was an influential philosopher who wrote on many issues ranging from
metaphysics, to ethics and the philosophy of science, and his views
continue to be influential today. In this course we will attempt to understand
Hume’s philosophy on all of these subjects both to better understand his
contribution to the philosophy of his day, but also to see what his arguments
can contribute to contemporary thought.

80-362 Russell
Intermittent: 9 units
Near the start of the 20th Century, Bertrand Russell helped to create what
today we call “Analytic Philosophy.” We will study Russell’s contributions to
this important approach to Philosophy by using his 1912 book, “The
Problems of Philosophy” as a springboard to other readings, many of which
are found in his collection, “The Basic Writings of Bertrand Russell.” The
issues we’ll cover include several specific challenges in the Theory of
Knowledge and Perception, and some of his contributions to Logic and
Mathematics. For example, What is the difference between appearance and
reality, and can we tell? Also, we’ll consider issues that stem from reflecting
on our thinking. For example, What constitutes a philosophical question?
And we’ll review Russell’s paradox about the set of all sets, his attempts at a
resolution, and how those affect contemporary set theory.

80-363 19th Century Foundations of Science
Intermittent: 9 units
Why do contemporary philosophers of science worry about the relationship
between theory and evidence, or what is it for some event to cause another?
These issues are not new, but have a rich history in the debates
among philosophers and scientists in the 19th and early 20th century.
This course will explore the roots of contemporary debates in the works of
Mill, Herschel, Whewell, Poincare; Maxwell, Hertz, Duhem, and Mach. We will
examine the issues of theories and evidence, scientific realism, the role of
models in science, the role of mathematics in science, concepts of space
and time, and ascription of causal relationships. The specific direction taken
by the class will be determined, in part, by the interests of the students who
enroll.
80-371 Philosophy of Perception

Fall: 9 units
This will be a course that covers the philosophy of perception from an empirical perspective. The first third of the course will begin with the problem of perception: how to account for the subjective quality of perception. We will explore theoretical challenges to providing an explanation of this feature (which we can call consciousness) and canvas theories that try to provide explanations. In the last two-thirds of the course, we focus on the science as a way of understanding subjective experience. We look carefully at color perception, olfaction, integration in the senses and the role of attention. This course will be a joint seminar between CMU and Pitt and will be co-taught with students from both campuses attending. It will be an upper level course meeting once a week and a high level of discussion, writing and preparation is expected. While there are no prerequisites, students might be aided by having at least one course in philosophy (preferably philosophy of mind or philosophy and psychology) or coursework in perceptual psychology or neuroscience.

80-380 Philosophy of Language

Intermittent: 9 units
Questions about language, meaning, and communication have a central place in both the history of analytic philosophy and the life of human societies. What do our words mean? What do we do by speaking them? What is the relationship between what our words literally mean and what we use them to communicate? What is it for a statement to be true but misleading? In what sense is it possible to experience a distinctively linguistic injustice? Should philosophers approach ordinary language as a cause of needless confusion, an indispensable source of insight, or both? In what ways is the study of language about the individual mind, in what ways is it about the speaker community? In spring 2020 this course will explore some major themes from the last century’s debates in the philosophy meaning and communication, with attention to how these topics connect with social and political questions and with work in feminist philosophy. Students who do not meet the prerequisites but have an interest in the topic are strongly encouraged to reach out to the instructor about exceptions.

80-381 Meaning in Language

Intermittent: 9 units
Human language involves an association between arbitrary signs and meaning. The study of meaning in language, semantics, is a recently developed subfield of linguistics, since it presupposes advances in phonology, morphology, and syntactic structure. In addition, semantics faces the conceptual challenge of saying what meaning is. This course will reflect the history of semantics within linguistic theory and examine solutions to the problem of the definition of meaning. The course begins with the meanings of words and examines how these meanings combine to give the meanings of sentences, based on the notion of truth conditions for indicative sentences. That notion of meaning is then extended to sentences in other moods, and to sentences that do not simply describe how the world is, including sentences which are modal, conditional, or simply fictional. Semantics is a subject that can be developed in a highly formal way, but here it will be presented to make it accessible to students with varied backgrounds and interests. The components of the resulting theory will apply to any human language, and be an important component in the toolkit of any student of language.
Prerequisite: 80-180

80-382 Phonetics and Phonology II

Intermittent: 9 units
This course is a continuation of Phonetics and Phonology I (80-282), and is designed to expand upon the phonetic and phonological skills and knowledge developed in that course. Students will carry out a phonetic study (either acoustic or perceptual) designed by the instructor; the particular topic varies from semester to semester. As co-researchers, students will be involved in all aspects of data collection and analysis. Lessons in phonetics will be designed to train students on the necessary skills and concepts required, including understanding the articulatory, acoustic, and perceptual correlates of the phenomenon under investigation, as well as data analysis and interpretation of the results. A presentation session will be organized for the end of the semester. In tandem with the phonetic study, a related phonological phenomenon will be investigated throughout the semester. This phenomenon will be explored by using a set of case studies that can be investigated through various phonological and psycholinguistic perspectives. We will cover major developments in phonological theory, including SPE-style features, feature geometry/autosegmental phonology, and Optimality Theory. We will also consider these phenomena in light of more recent approaches to phonological representation, including Exemplar Theory and Articulatory Phonology. Assessment of phonetics will primarily come from the research project and in-class lab work, but will be supplemented with quizzes to ensure that core concepts are acquired. Assessment of phonology will primarily come from problem sets. Students will finish this course with a solid understanding of how to do phonetic research, and an appreciation of how various theoretical frameworks have attempted to account for phonological phenomena.
Prerequisites: 80-180 and 80-282

80-383 Language in Use

Intermittent: 9 units
In ordinary conversation, what a speaker conveys by the utterance of a sentence may go beyond, or be quite different from, the meaning that could be assigned to the sentence or expression she uses without consideration of the context in which it occurs. For example, the sentence “I have homework” means one thing; but it conveys something more when uttered in answer to the question “Do you want to go see a movie tonight?” In this course, we explore how the systematic study of linguistic meaning can be expanded from the domain of the sentence to the domain of connected, multiparty discourse. This involves taking into account the contributions of context, and of speaker and hearer’s beliefs, goals and intentions, to the construction of meaning. This course is one of the set of courses on language and meaning offered by the Program in Linguistics, including in addition to this: 80-263 It Matters How You Say it, 80-288 Intonation, and 80-381 Meaning in Language. Each of these courses can be taken independently; as a set, these courses provide a comprehensive introduction to contemporary approaches to natural language semantics and pragmatics.
Prerequisites: 80-180 or 80-100

80-384 Linguistics of Turkic Languages

Intermittent: 9 units
In this course we look at languages from within a single language group, Turkic. Turkic languages are spoken across continental Asia and include such languages as Turkmen, Tatar, Kazakh, Uighur, and Uzbek. In this course we concentrate especially on Yakut (Sakha) and Azerbaijani. Modern Turkish will provide a reference language. We look at various linguistic systems within each language (phonology, morphology, syntax, and writing systems) both to understand each particular language and to see how the languages are related. We consider the impact of diachronic factors on the synchronic study of language. This course can be seen as an extended case-study for applying concepts and analytical strategies from basic linguistics, as taught in Nature of Language, Phonetics and Phonology, Invented Languages, and other relevant courses.
Prerequisite: 80-180
80-385 Linguistics of Germanic Languages
Intermittent: 9 units
The Germanic languages include English, Dutch, Frisian, German, Pennsylvanisch, Afrikaans, Yiddish, Icelandic and the Scandinavian languages, excluding Finnish. The course will serve as an extended case-study for the application of concepts and analytical strategies taught in basic linguistics courses to some of these languages. Specifically, we take a bottom-up approach to Dutch, Frisian, Icelandic, and Danish, starting with raw language material whenever possible, which we progressively analyze in terms of phonetics and phonology, morphology, and syntax. These case studies lead to comparisons between the languages and insight into their development and divergence over time. We follow this hands-on approach with historical and grammatical overviews, touching on some of the outstanding issues in Germanic linguistics. The approach should also help bring out the relevance of diachronic factors in the synchronic study of language, with historical forms of English being open to investigation, as these often reflect patterns found in contemporary Germanic languages.
Prerequisite: 80-180

80-388 Linguistic Typology: Diversity and Universals
Intermittent: 9 units
What is the most common word order? What is the rarest consonant? What kinds of case marking are attested in the world's languages? Which linguistic structures tend to co-occur? What can we learn by looking at the rarity of linguistic structures? These are the kinds of questions central to linguistic typology, the study and classification of languages based on their structural properties. In this course we will look at the variety of linguistic structures attested in several linguistic subfields, including phonology, morphology, syntax, and semantics. Understanding linguistic diversity is closely tied with the search for linguistic universals, since there appear to be some ways in which linguistic structures seem to be limited. But what are the nature of those limits (if they truly exist), and what do they tell us? We will also look at methodological issues that arise in comparing languages and forming meaningful generalizations.
Prerequisites: 80-180, and one of 80-280, 80-282, 80-285 or permission of the instructor.
Prerequisites: 80-180 and (80-282 or 80-280 or 80-285)

80-405 Game Theory
Intermittent: 9 units
Game theory is the study of interactive decision-making: making choices in the context of other agents who are also making choices. Famous examples include the "Prisoner's Dilemma" (pitting rational self-interest against the benefits of cooperation), and the "Cournot duopoly" (a basic model of market competition and supply-and-demand). Game theory has been applied to situations as diverse as traffic flow, auctions, the search and competition for scarce resources, and bargaining. This course will develop conceptual and technical facility with the mathematical tools used to model and analyze such situations. We will cover games in strategic and extensive form and games of perfect and imperfect information; we will also study solution concepts such as Nash equilibrium and rationalizability. Finally, throughout the course we will take the opportunity to actually play several of the games we study to help build intuitions and foster insights into the formal mathematical models we develop.

80-411 Proof Theory
Intermittent: 9 units
An introduction to the general study of deductive systems and their properties. Topics include the natural deduction and sequent calculi; cut-elimination and normalization theorems; metamathematical properties of first-order logic and theories of arithmetic; and conservation theorems.
Prerequisites: 21-300 or 80-310 or 80-311

80-419 Interactive Theorem Proving
Intermittent: 9 units
Interactive theorem proving involves using computational proof assistants to verify that mathematical proofs are correct, or to verify that hardware and software designs meet their formal specifications. This course uses a new interactive theorem prover, Lean, to explore this new technology and its logical foundations. We will study dependent type theory, a powerful and expressive language for representing mathematical objects, algorithms, and proofs. We will also consider automated methods that can be used in support of formal verification, including propositional, equational, first-order, and higher-order methods, as well as decision procedures for real and integer arithmetic.
Prerequisites: 80-211 or 80-310 or 15-317 or 21-300
Course Website: https://leanprover.github.io/theorem_proving_in_lean/

80-430 Ethics and Medical Research
Intermittent: 9 units
Ethics Medical Research: This course covers foundational issues in the ethical evaluation and regulation of research involving human subjects. It begins with a historical overview of the origins of research ethics after World War II as a response to high profile cases of abuse or scandal. This unit covers "classic cases" including the Tuskegee syphilis study, the Willowbrook hepatitis study, the Jewish Chronic Disease Hospital Case, and others. It also covers seminal documents such as the Nuremberg Code, the Belmont Report, and the current federal regulations known as the Common Rule. Against this historical backdrop, the course then examines foundational philosophical issues in human-subjects research including ethical issues in clinical trial design, the concept of equipoise and the use of placebo controls, the requirements of justice in the research context, and the values of privacy and informed consent.

80-431 Meta-ethics
Fall: 9 units
First we will survey of proposals for necessary and sufficient conditions for "x is a morally permissible act". Then we will consider T.S. Scanlon's claim that metaethics is immune from criticism from other subjects. We will then consider moral voting rules—varieties of consequentialism and Scanlon's work take all method of reasons. We will take up arguments that there are, or are not moral facts, and moral particularism— the doctrine that while there are moral facts, there are no informative true moral generalizations. Finally, we will consider biological accounts of the sources of morality and agency by Binmore, Kitcher, Churchland and others, and there force, if any, against the very idea of normative ethics.

80-445 Shift Capstone Experience
Fall and Spring
The Societal and Human Impacts of Future Technologies capstone experience will be taken in either the fall or spring of the senior year. It is required for all SHIFT minors. The purpose of the capstone experience is for students to demonstrate learning over time within the minor. Key learning experiences include incorporating concepts, ideas, frameworks from multiple disciplinary perspectives, using disciplinary perspectives in appropriate ways, given their complementary strengths weaknesses, generating a multidisciplinary (2) of some current or near-future technology, collaborating with people of different disciplinary backgrounds, and communicating a single, integrated analysis of the impacts opportunities of this novel technology ( recommended actions). SHIFT minors should work with the minor advisor during the Spring of their junior year to design an appropriate capstone experience.

80-447 Global Justice
Intermittent: 9 units
Until recently, the dominant view of international relations has been that the governments and citizens of one country have no moral obligations to those beyond their borders. With the rapid growth in globalization has come a drastic shift in attitudes about our obligations to those with whom we share global institutions of trade but neither legal systems nor national identities. This course aims to introduce students to the problem of global distributive justice in the context of a globalized world, with emphases on both theoretical accounts of justice and the practical implications of those accounts for important current issues. Theoretical topics will include the nature of justice, the sources and limits of our moral obligations, and how and whether those notions of justice extend to global society; while applied topics will include our obligations with regard to the environment, human rights deficits, the status of women, and global economic policy.
80-449 EHPP Project Course
Fall: 12 units
The Ethics, History and Public Policy Project Course is required for the Ethics, History and Public Policy major and is taken in the fall semester of the senior year. In this capstone course, Ethics, History and Public Policy majors carry out a collaborative research project that examines a compelling current policy issue that can be illuminated with historical research and philosophical and policy analysis for a chosen client. The student develops an original research report based on both archival and contemporary policy analysis and they present their results to their client and a review panel.

80-484 Language and Thought
Intermittent: 9 units
The goal of this course is to provide students with the opportunity to creatively explore some difficult questions about the relationship between language and thought, questions such as: How does the human capacity to use language relate to the human capacity to think? Does the language that a person speaks affect the way she thinks? If meaning is in the head, how can we succeed in communicating with each other? How is our ability to reason related to our ability to successfully communicate? None of these questions have definite answers; throughout the course, we will draw on work in philosophy, psychology and linguistics to try to understand some of the possible answers that might be entertained. Students in the course should be prepared for extensive reading, writing and peer discussion assignments.

80-488 Acoustics of Human Speech: Theory, Data, and Analysis
Intermittent: 9 units
In this course, students will learn how to acoustically analyse human speech, and in so doing, will learn about both universal and language-particular acoustic characteristics of human speech. The class, which will comprise both lectures and a lab component, will introduce the basic principles of the physics of sound and how the source spectrum is modified by the vocal tract, but the focus throughout will be towards developing a solid understanding of how to perform the relevant analyses. Each week will introduce a new topic, chosen to exemplify a particular acoustic phenomenon. Lectures for that week will provide the theoretical basis for understanding the phenomenon, both in terms of acoustic theory and in articulatory terms. The lab for that week will provide students with relevant acoustic data to analyse using PRAAT, an open-source software used for acoustic analysis. Potential topics include: What does it mean to say someone speaks with "vocal fry", and how do we measure this? Why do children replace [r] with [l]? How can we compare sounds in two different languages? For example, what are the acoustic characteristics of [r] and [l] in English and Japanese, such that these sounds count as two different sounds in English, but are so similar in Japanese? What makes an [s] so noisy compared to an [f]? What happens to speech sounds when we talk quickly, or when we’re sick and our nose is stuffed up? At the conclusion of the course, students will have a solid understanding of the acoustic characteristics of human speech, both in terms of the underlying theory and how to measure such phenomena. Further, they will be able to translate questions about speech into measurable acoustic variables. There is no prerequisite for this course. While technical material will be covered, no background in linguistics, acoustics, physics, or math is assumed, and all required skills will be taught as needed.

80-495 Independent Study
Fall and Spring
Independent Study

80-501 Philosophy Senior Honors Thesis I
Fall: 9 units
Philosophy Department majors with outstanding academic records and intellectual promise will be given the opportunity to earn Dietrich College Honors by engaging in original research under the direction of an individual faculty member. Research topics are selected by student. Students must submit a proposal to the Dean's Office for permission.

80-502 Philosophy Senior Honors Thesis II
Spring: 9 units
Philosophy Department majors with outstanding academic records and intellectual promise will be given the opportunity to earn Dietrich College Honors by engaging in original research under the direction of an individual faculty member. Research topics are selected by student. Students must submit a proposal to the Dean's Office for permission.

80-511 Thesis Seminar
Spring: 6 units
This course provides a forum for the presentation and detailed discussion of research done by students, be they undergraduates working on their Senior Thesis or graduate students engaged with their M.S. thesis.

80-513 Seminar on Philosophy of Mathematics
Intermittent: 9 units
This seminar will focus on two themes in philosophy of mathematics. First, we will consider contemporary readings in epistemology on the value of knowledge and the nature of understanding in light of recent work on mathematical understanding and explanation. Second, we will try to understand how mathematics enables its practitioners to come to consensus as to whether a mathematical claim has been established, and was able to do so even before there were formal axiomatic systems to serve as arbiters of truth. To that end, we will consider mathematical debates in the commentaries on Euclid, in early analysis, and in nineteenth century mathematics.

80-514 Categorical Logic
Intermittent: 9 units
This course focuses on applications of category theory in logic and computer science. A leading idea is functional semantics, according to which a model of a logical theory is a set-valued functor on a category determined by the theory. This gives rise to a syntax-invariant notion of a theory and introduces many algebraic methods into logic, leading naturally to the universal and other general models that distinguish functoriality from classical semantics. Such categorical models occur, for example, in denotational semantics. e.g. treating the lambda-calculus via the theory of cartesians closed categories. Higher-order logic is treated categorically by the theory of topoi. We shall see how this idea connects logic with topology (the models of a theory form a space). A prerequisite for this course is familiarity with basic category theory (as treated in the course 80-413/713).

80-515 Seminar on the Foundations of Statistics
Intermittent: 9 units
This decision-theoretic seminar is organized in three parts. 1. In the first we examine Savage's theory of subjective expected utility, primarily chapters 2-5 of his classic book, The Foundations of Statistics. 2. In the second part of the course, we focus on the following issues: 2.1. A comparison of Savage's theory and deFinetti's criteria of coherence. 2.2. Personal vs. group decisions. Topics to include: Arrow's impossibility theorem, consensus, and Savage's position in §7.2 13.5 of his book. 2.3. Contemporary philosophical questions such as the principle of sure-thing violation and its relationship to Savage's P2. 3. For the third part, we discuss issues related to Indeterministic and/or Imprecise Probability (IP) theory. The seminar explores some of the ongoing research programs falling under IP, mostly as reflected in the Society for Imprecise Probability: Theories and Applications (www.sipta.org).
80-517 Seminar on Topics in Logic: Algorithmic Randomness
Fall: 9 units
What is randomness? One way to think about it is as a property of sequences of, say, events, experimental outcomes, observations, or symbols from some alphabet: a sequence is random if it is unruly, irregular, patternless. This conception of randomness plays a significant role in a variety of fields, including cryptography, information theory, the foundations of probability and statistics, computability theory, and certain computational models of learning. To build some intuitions about the two binary strings 010111110 and 0101010101. The first string seems more random-looking than the second. This is because the second string displays an obvious pattern that is very easy to describe and that makes it look highly predictable. But can these intuitions be made precise? Is it possible to provide a rigorous mathematical characterization of the notion of a random sequence? This seminar will provide an introduction to the theory of algorithmic randomnness, an active branch of computability theory according to which a sequence is random if it does not display any algorithmically detectable patterns. We will begin by discussing von Mises’ theory of collectives, a precursor to the theory of algorithmic randomness; then, we will see how von Mises’ work led to the modern computability-theoretic approach to randomness. We will focus on both the mathematical details of the theory of algorithmic randomness and its philosophical consequences. We will pay special attention to the connections between randomness, probability, and the philosophical interpretations of probability. Among the questions that we will address are: What is the relationship between probability and randomness? Is probability more primitive a concept than randomness, or is a precise analysis of randomness needed to understand what probabilities are? Is it possible to define “absolute” randomness? Does randomness have to satisfy any laws?

80-518 Seminar on Topics in Logic
Intermittent: 9 units
Topic: Introduction to Homotopy Type Theory
Homotopy Type Theory (HoTT) is a new field of mathematics that extends Martin-Löf’s dependent type theory by the addition of the univalence axiom and higher inductive types. In HoTT, we think of types as spaces, dependent types as fibrations, and of the identity types as path spaces. We will see that many spaces that are familiar to topologists can be represented as higher inductive types, and we will develop the basic theorems and constructions in HoTT to reason about them.

80-519 Seminar on Computability: History and Analysis
Spring: 9 units
The history of computability is presented in the context of pertinent developments in mathematics and the sciences, in particular, in astronomy. The analysis of the notion takes seriously normative philosophical considerations, starting with Leibniz and Descartes. Complementary developments in mathematics and logic during the second half of the 19th century led to fundamental issues in logic during the first half of the 20th century. A certain “resolution” of those issues was achieved in the work of Post and, in particular, Turing. The seminar will end with a brief discussion of the abstract notion of “computable dynamical system” and its use in the discussion surrounding the “Church-Turing Thesis”.

80-520 Seminar on Philosophy Science
Intermittent: 9 units
In the past 25 years there has been a great deal of research in Machine Learning, Statistics, and Philosophy on inferring graphical causal models from both experimental and non-experimental data, under a variety of different background assumptions. The goals of this course are (i) to give students enough background to be able to read, understand, and contribute to the current literature on topics in the representation, use of, and inferences about causal graphs of various kinds; (ii) to relate the current computer science/statistics literature on causation to the philosophical literature on related topics. The broad topics of the course will be: 1. How to use various kinds of graphs for representation of probabilities, causal models, actual causation, and counterfactuals. 2. How to use graphs to answer questions about conditional probabilities, the effects of manipulations, and counterfactuals. 3. Assumptions relating probabilities to causation.

80-521 Seminar on Formal Epistemology: Belief and Evidence
Spring: 9 units
There has been a flurry of recent work on a variety of modal logics designed for reasoning about knowledge, belief, and evidence, in both static and dynamic contexts. What is the relationship between knowledge and belief? What is the role of evidence and justification? How do we react to new information, update our beliefs, and reason conditionally? These are old questions which modern logical frameworks promise to shed new light on. In this seminar, we will read and analyze contemporary papers on topics, both to gain an understanding of the current state-of-the-art, and to critically assess the extent to which these formal frameworks are genuinely enhancing our understanding of the underlying phenomena of interest.

80-524 Topics in Formal Epistemology: The Topology of Learning
Intermittent: 9 units
When faced with a question concerning learning or scientific method, one habitually reaches for logic and probability theory. But sometimes habits should be questioned. There is increasing awareness, scattered across philosophy, informatics, mathematical statistics, that the relevant issues are more fundamentally topological. That may sound shocking: what could rubber geometry have to do with learning or inductive inference? The answer is that the set of empirically verifiable propositions over a set of possibilities automatically satisfies the axioms of a topological space over possible worlds. Once that is recognized, there is a systematic translation between topology and familiar concepts and issues in learning, statistics, and the philosophy of science. This seminar will introduce the relevant topological concepts and will explore the methodological correspondences in detail. Topics covered include Hume’s problem of induction, the problem of non-refutable theories and paradigm choice, convergence to the truth, simplicity and Occam’s razor, statistical model selection, causal discovery, and computability. The class will place students at the cutting edge of research in this fresh and exciting new area, and will provide them with a high-level, explanatory perspective that unifies much of the detail encountered in standard statistics and machine learning curricula.

80-529 Incommensurability: Ethics and Philosophy of Science
Intermittent: 9 units
Claims that certain things are incommensurable are common in several areas of philosophical discourse. In the philosophy of science, for example, it has been claimed that different scientific theories, or particular claims or terms within these theories, are incommensurable. In ethics, some have argued that different types of values (rights, utility, personal commitments, individual identities) are incommensurable. In many cases, incommensurability is treated as a problem that needs to be surmounted in order for agents to make rational decisions to compare alternative theories or to evaluate acts or policies that implicate different kinds of value. The first part of this course examines what incommensurability is supposed to be, how it supposedly arises in various fields, and what kind of challenge it poses for theories of rationality and rational choice. In the second part of the course we examine theories in which incommensurability is not a problem to be overcome, but a kind of moral requirement in itself. For instance, the injunction at the heart of Kantian ethics not to treat agents (with dignity) like things (with a price) requires that these entities not be brought into certain kinds of comparative relationship. Similar claims seem to be at work in certain liberal political theories (Walzer and Rawls), in views that seek to limit the scope of goods that can be distributed in markets, and in views of science that treat conceptual diversity as an source of important social benefit. A goal of the course is to show how a variety of issues across diverse philosophical contexts have a common structure and how formal work in social choice (e.g., Arrow impossibility results), and decision theory (e.g., theories of choice that relax the ordering assumption) can help to clarify and resolve important problems.

80-530 Seminar on Ethical Theory
Intermittent
This seminar will focus on classic and contemporary accounts of moral and political autonomy and their application to current topics in ethics, political philosophy, and global justice. We will pay special attention to the neorepublican notion of freedom as non-domination as a way and to what extent this concept interacts with competing conceptions of autonomy, and what can be gained or lost by applying the neorepublican framework to various debates.

80-536 Ethics & Policy of AI
Intermittent: 9 units
AI, robots, and other autonomous technologies are having deep and wide impacts on individuals, communities, and societies. In this seminar, we will examine the ethical policy dimensions of these novel (autonomous) technologies. We will emphasize analyses of current and near-future systems, grounded in the actual technological details. Students will be expected to have either prior ethics or prior policy familiarity/experience.
80-537 Seminar on Research Ethics: Philosophical Foundations
Intermittent: 9 units
This course covers foundational issues in the ethical evaluation and regulation of research involving human subjects. It begins with a brief overview of the historical origins of research ethics after World War II and the development of the regulatory system for oversight of research with humans in the US. It then examines philosophical questions such as: whether there is a moral imperative to conduct research and, if so, what such an imperative justifies; whether the system of prospective review of research is necessarily paternalistic or whether it can be grounded in alternative norms; how to think about and regulate risk in research; what is the nature and purpose of informed consent and under what conditions can it be waived; and what requirements should be imposed on research sponsored by entities from high-income countries that is carried out in low or middle-income countries. In addition, the course covers ethical issues in clinical trial design, the concept of equipoise, the use of placebo controls, and the requirements of justice in the research context.

80-580 Seminar on the Philosophy of Language
Intermittent: 9 units
This course will provide an advanced level introduction to core topics and issues in contemporary philosophy of language and linguistic semantics. Readings will include both classic papers that provide the foundation of contemporary discussions (e.g. Frege, Kripke, Montague) and papers drawn from the contemporary literature. Possible topics include: reference and problems of reference (hyperintensionality and de se); modality; semantics of tense; introduction to formal semantic theory; compositionality; convention and linguistic meaning. This is a graduate level course. Interested undergraduates require permission of the instructor to enroll.

80-595 Senior Thesis
Fall and Spring
Philosophy Department majors writing a senior thesis, and are not participating in the Dietrich College Senior Honors Program, are given the opportunity to engage in original research under the direction of an individual faculty member. Research topics are selected by student.