Department of Philosophy Courses

Note on Course Numbers

Each Carnegie Mellon course number begins with a two-digit prefix which designates the department offering the course (76-xxx courses are offered by the Department of English, etc.). Although each department maintains its own course numbering practices, typically the first digit after the prefix indicates the class level: xx-1xx courses are freshmen-level, xx-2xx courses are sophomore level, etc. xx-6xx courses may be either undergraduate senior-level or graduate-level, depending on the department. xx-7xx courses and higher are graduate-level. Please consult the Schedule of Classes (https://enr-apps.as.cmu.edu/open/SOC/SOCServlet) each semester for course offerings and for any necessary pre-requisites or co-requisites.

80-100 Introduction to Philosophy
All Semesters: 9 units
In this introductory course we will explore three major areas of Philosophy: Ethics, Metaphysics, and Epistemology. Accordingly the course is divided into three sections. In each section we will read primary sources and discuss some of the main philosophic problems associated with that area. These will include: moral problems (Ethics), problems rising from the debates about free-will, personal identity or intelligence (Metaphysics), and inquiries about the scope and limits of human knowledge (Epistemology). We will then introduce some theories designed to solve such problems, and try to understand the strengths and weaknesses of these theories. We will apply different techniques and theories to issues that we might encounter in the real world. We will use class discussions, homeworks and papers to learn skills for evaluating arguments. These skills include: how to present a philosophic argument, what are the assumptions that justify it, what are its weaknesses and its strengths, whether such weaknesses can be resolved and, if they cannot be resolved, why.

80-110 Nature of Mathematical Reasoning
Intermittent: 9 units
This course focuses on understanding the principles and problems at the root of mathematical reasoning; it is not a course on any specific mathematical theory, like linear algebra or topology. We will explore the foundations of mathematics, both in terms of their historical origin and their modern purpose as a base for the study of mathematics. Then we will see how problems which seem to have no intuitive solution look simple after being put in the right mathematical form, but also consider the limitations this type of approach. We will treat such issues as they arise both in applied fields (policy decision-making, physics, computer science) and as more recreational, speculative and abstract (Conway's game of life, the works of Escher, music). The course is aimed for students at the freshman and sophomore level who do not necessarily intend to pursue a mathematically intense major.

80-130 Introduction to Ethics
Intermittent: 9 units
As human beings, we frequently grapple with difficult moral questions. How ought I treat my friends and peers? What kinds of policies should a government adopt? When, if ever, can we justify harm? These are the kinds of questions we will consider as we survey the most prominent, contemporary ethical theories. Along the way, we will consider the implications of those theories for real world ethical issues, including capital punishment, pornography, and universalized healthcare.

80-135 Introduction to Political Philosophy
Intermittent: 9 units
As an introductory course, we will seek to trace out the historical and philosophical dimensions of the polis from its origins in Ancient Greece to its current manifestation in present-day society. Special emphasis will be placed on the concept and practice of "democracy." We'll begin with the history of political philosophy from Plato and Aristotle (two of the early critics of democracy) to the modern period and the arguments in support of "republicanism" as found in the Federalist Papers (Madison, Jay, Hamilton). These historical moments cast light on the philosophy behind the development of the US constitution. Following Ketcham, we'll discuss the debate between the "ancients and moderns," enlightenment ideas regarding liberty and equality as well as the distinction between private rights and public goods. After presenting some fundamental justifications for democracy and our current models of democratic governance, we'll study the basic political frameworks of our day through a thorough-going analytic analysis of the writings and arguments of recent and contemporary political philosophers such as John Rawls, Ronald Dworkin, Robert Nozick, Charles Talyor, Michael Sandel, and Annette Baier. The course will end with a discussion of the theory and practice of deliberative democracy and a chance for students to engage in this model of democracy through the activities of an ersatz "deliberative poll."

80-136 Social Structure, Public Policy & Ethics
Intermittent: 9 units
The course will consider ethical questions surrounding social structure and public policy. It will analyze the role of political institutions and individual citizens in dealing with some of the greatest challenges facing our world: Global health crises, the spread of (and threats to) democracy worldwide, and world poverty. Some of the questions we will consider include:
Are developed countries obligated to ameliorate poverty by providing foreign aid? What is democratic governance, and what do democratic representatives owe to their constituents? Should wealthy nations and corporations assist in the fight against life-threatening diseases worldwide? The course uses ethical and political theory, case studies, and empirical evidence to consider these questions.

80-150 Nature of Reason
Intermittent: 9 units
This course offers an intellectual history of philosophical views regarding the nature of human reasoning in mathematics and the sciences, from ancient to modern times. The first part of the course traces the search for deductive methods for obtaining certain knowledge, starting with Aristotle and Euclid, and continuing through the Middle Ages and late Renaissance thought, to the work of Boole and Frege in the nineteenth century. The second part of the course considers the history of skepticism about empirical knowledge, covering Plato, Sextus Empiricus, Descartes, Pascal, and Hume, along with replies to skepticism in the works of Bayes and Kant. The third part of the course discusses theories of the nature of mind, culminating in the computational conception of mind that underlies contemporary cognitive science.

80-180 Nature of Language
Fall and Spring: 9 units
Language is used to talk about the world or to describe it, but how do we go about describing language itself? Linguistics is the name given to the science of language, whose task it is to give such a description. The discipline of linguistics has developed novel tools for describing and analyzing language over the last two hundred years and in this course we learn what these tools are and practice applying them. Sub-areas of linguistics which we study include phonetics (the study of speech sounds), phonology (the study of sound systems), morphology (the study of parts of words), and syntax (the study of combinations of words). Beyond this, we look at changes in language over time, and we consider the puzzle of linguistic meaning. The methods of linguistics are useful in the study of particular languages and in the study of language generally, so this course is useful for students of foreign languages as well as those interested in going on to study language acquisition, psycholinguistics, sociolinguistics, philosophy of language, and computer modeling of language.

80-201 Epistemology
Intermittent: 9 units
What does it mean to have knowledge? How do we know things, and what can be known? These are some of the central questions in the discipline of epistemology ("the theory of knowledge"). The answers to these questions are not as obvious as some casual thought may suggest. If you think the senses provide us with knowledge, how will you know when your senses deceive you? If you think knowledge is gained through reasoning, where will you start reasoning? This course investigates these questions, focusing on both classic questions and treatments and more recent work in the field of social epistemology. There are no prerequisites, but students may find previous experience with philosophical reasoning to be helpful. Students both with and without such experience are encouraged to take the class.

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
This web-based course introduces students to central issues in logic and develops their ability for constructing and refuting arguments. It addresses the question: How can one 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. Presentation: The material is presented on-line, though some exercises must be done with pen and paper. Additional reading of historical and philosophical character complements the systematic on-line presentation. Weekly small discussion meetings with collaborative reviews, substantive discussions and critical reflections supplement the on-line material.

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.

Course Website: https://leanprover.github.io/logic_and_proof/

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. In the course of our inquiry, we will take a historically informed approach to studying logic and argumentative fallacies. We will also discover that these tools are useful for constructing and analyzing arguments in all disciplines from philosophy and history to psychology and physics. Our primary goal is to learn to use these tools to make our thinking and writing clearer, more precise, and more critical. To that end, our coursework will consist in homework and exams on topics in logic, as well as essays on a wide variety of topics. This course is intended for students from any discipline who would like to improve their writing and critical thinking skills.

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 them. 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 universal conclusions ever be justified by a finite data set? Does explanation contribute 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
Does smoking cause cancer? What causes global warming? Would World War II happen if World War I had never happened? In our daily life and science, people often attempt to answer such causal questions, and probability theory, as a mathematical model of uncertainty, serves as a fundamental tool. This course explores the history of causality and probability and the basic methodologies for causal inference and statistical analysis. In particular, we will study what causality is, how it is related to and different from correlation, the relationship between causality and regression, the benefit of using causal knowledge, the classical ways to find causal relations, when it is possible to achieve so from purely observational data, and machine learning methods for discovering causal structure.

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 four such radical transformations: The "Copernican Revolution" (or "the Scientific Revolution") of the 16th and 17th centuries, the Darwinian revolution of the 19th century, the quantum revolution of the late 19th and 20th centuries, and Einstein's revolution in the science of space and time of the 20th century. This course has two intertwined components: history of science and philosophy of science. In the historical component, we will examine in some detail the four major scientific revolutions. The philosophical components will help us understanding the reasoning involved in scientific theory change. This course does not required detailed knowledge of any of the sciences used in examples of revolutionary change.

80-230 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.

80-241 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.

80-242 Conflict and Dispute Resolution
Intermittent: 9 units
Conflict is an intractable feature of human life, whether occurring between family members, friends, coworkers, political organizations, nations, and even within oneself. You must then be prepared to negotiate with others to get your job done, to advance your career, and even to maintain meaningful personal relationships with your family and friends. The purpose of this course is to help prepare you for these negotiations. In particular, in this course, you will reflect on your current approaches to conflict, study the nature of conflict and why it tends to escalate, and develop your own skills for principled negotiation. Throughout the course you will also participate 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.

80-244 Environmental Ethics
Intermittent: 9 units
The aim of the course is to provide students with an introduction to environmental ethics. One aspect of environmental ethics is the study of values underlying human relations to the natural environment. In particular, we are interested in issues that arise when these values conflict. This course begins with a discussion of our current environmental crises, and different approaches to solving these crises. Many of these solutions, however, depend on particular kinds of knowledge, particularly scientific knowledge, about our environment. Thus, another important aspect of environmental ethics is determining what we do, and what we can, know. To address these issues, we will explore some problems in philosophy of science, with special emphasis on the various eco-sciences.

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
Moral psychology is the study of how we think about morality, make moral judgments, and behave in moral situations. This has important implications for how we should think about morality, make moral judgments, and behave in moral situations. In this course we will examine empirical research on moral thinking and behavior by psychologists, neuroscientists, economists, and philosophers and discuss the implications this research has for issues in ethics. We will address questions such as: What motivates our moral behavior? Do we ever act altruistically or do we only do the right thing because it's somehow in our own interest? Is it even possible to tell what people's real motivations are? How do we make moral judgments and decisions? What roles do reason, intuition, and emotion play in our moral judgments? What role should they play? What role should a person's beliefs, desires, and intentions play in our judgments of how blameworthy the person is or of how much punishment he or she deserves? What role should the outcomes of the person's actions play in our judgments of him or her? Should we hold people responsible for things that are not entirely under their control?

80-247 Ethics and Global Economics
Intermittent: 9 units
This course will examine contemporary ethical issues in global economics, and consider what obligations states and individuals have in resolving those issues. Along the way, we will ask questions like: What are the advantages and disadvantages of international trade? What do economically and technologically advanced states owe developing states? To answer these and other questions, we will apply ethical frameworks to a series of case studies in global economics. Readings will be drawn from philosophy, economics, political science, and public media (newspapers, magazines, etc.).

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.

80-250 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 tracing the various historical and intellectual movements that led up to and through the flourishing and downfall of Periclean Athens. A study of Socrates (as represented in Aristophanes' comedy and Plato's early dialogues) will lead to an in-depth reading of Plato's Gorgias, Symposium and sections of the Republic. We will approach Aristotle through his 'practical philosophy' as presented in the Nicomachean Ethics. The final sections will discuss the Epicurean, Skeptic, and Stoic movements as well as the work of Cicero. Excerpts from other works of Plato and Aristotle as well as Martha Nussbaum's recent work on Aristotle and Hellenistic philosophy will accompany selected parts of the course.

80-251 Modern Philosophy
Intermittent: 9 units
Descartes' project to doubt all received knowledge and begin from scratch marked the beginning of an intellectual upheaval, helping to launch what is now called the Modern period of philosophical thought; the Western world is today the heir of modernism. Locke, Leibniz, Hume, and Kant are several of the most important figures of this period. We will examine works of these thinkers, exploring both the new sorts of questions that these philosophers raised and their new methods of doing philosophy, which together mark a fundamental break with the traditions that preceded them. We will devote special attention to the new theories of knowledge they proposed and to their works in ethics and political philosophy. The philosophical revolution of the 17th and 18th centuries occurred during a time of great scientific progress and political upheaval in Europe; as part of our course we will consider the relation of certain of these developments to the new questions and methods of the modern philosophers and to their works in ethics and political philosophy.

80-252 Kant
Intermittent: 9 units
Immanuel Kant's 'Critical philosophy' may be seen as the result of his attempts to determine the sources of human knowledge, and to find metaphysical foundations for Newton's mechanics. This course will involve readings in Kant's /Critique of Pure Reason/ and other texts. Emphasis will be placed on understanding Kant's thought in the context of contemporary intellectual developments and on his theory of human cognition.

80-253 Continental Philosophy
Intermittent: 9 units
This course provides students with an overview of key movements in European Philosophy. The historical background covers Descartes, Kant, Kierkegaard, and Nietzsche. The central tenets of phenomenology and existentialism (e.g., intentionality, Being-in-the-World, Bad Faith) will be discussed in the context of selected works from Husserl, Heidegger, Sartre and Merleau-Ponty. The course will conclude with the background for and current work of Habermas.

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 Empiricism and Rationalism
Intermittent: 9 units
A central issue in Western philosophy has been whether reason or experience (or some of both?) lies at the foundation of human knowledge, and the 17th and 18th centuries are a defining period of European history because they contribute the basic model of science and the ideals of intellectual and political enlightenment that are still dominant today. Specifically, we will focus on the problems encountered in trying to give an adequate account of the nature of the external world, the structure of our minds, and the nature and limitations of knowledge in the thought of Descartes, Locke, Leibniz, Berkeley, and Hume. The course has two main goals: (1) to study the metaphysical and epistemological theories of selected philosophers, paying close attention to the arguments offered on behalf of often very strange positions, and (2) to help you improve your analytical and critical skills, including, for example, extracting and evaluating philosophical arguments.

80-264 William James and Philosophical Psychology
Intermittent: 9 units
This course will be devoted to the reading and discussion of William James' "Principles of Psychology", including its relevance to foundational questions about current research. Though first published in 1891, the foundational issues addressed in this landmark work have not lost their relevance; it is often said that this work set the agendas for much of the research subsequently carried out in psychology. This course should appeal to anyone interested in philosophy of mind, philosophy of psychology, and philosophy of science.

80-270 Philosophy of Mind
Intermittent: 9 units
The mind poses one of the greatest challenges to understanding how the world works. What is a mind? What is consciousness? What is sensing? What is agency? How are these facets of subjectivity related to the objective, physical world? In this course, we tackle these challenging questions with a philosophical approach that highlights analysis and argument, though we will also bring in relevant empirical understanding of the mind and brain to enrich our discussion (a complementary course, Philosophy and Psychology, is taught in alternate years where the empirical issues are the focus with enrichment from philosophy). A central practical aim of this course is to promote development of analytical skills through practice engaging with arguments.

80-271 Philosophy and Psychology
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? Why should you think there is an external world? What is 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
We use language to communicate. Communication seems to involve something like the transfer of ideas or thoughts from one individual to another. In this course, we'll try to understand how that works, given that we cannot in fact take our thoughts out of our heads and show them to someone else. We'll explore different views on the relationship between thought and meaning, and different views about how language succeeds in communicating thoughts and ideas. We'll explore the idea of a language of thought, and ask whether the language we speak influences our thought. At the same time, we will want to understand how it is that language hooks up to the world, enabling us to talk not only about what we think, but also about the way things actually are. We'll look at the role of inference in language understanding, and at the nature of non-literal communication, in particular metaphor. The course will be based on readings drawn from philosophy, linguistics and psychology. 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 Syntax and Discourse
Intermittent: 9 units
In English and many other languages, it is possible to express the same content in several different, but closely related ways. For example, the following sentences all seem to have the same content: "John saw Mary"; "Mary was seen by John"; "It was John who saw Mary"; "John, he saw Mary". Yet the sentences are not interchangeable in discourse. Sentences can also be differentiated by intonation: in the sentence John saw Mary, any of the three words can be emphasized, and these changes in emphasis have consequences for what the sentence expresses. In this course, we will develop the view that these syntactic and intonational manipulations carry information about whether information is being presented as new or old, novel or familiar, foregrounded or backgrounded, and about how the content presented is connected to ongoing discourse. In the course, students will learn the methodology for exploring the discourse functions of different constructions, and skills and concepts to use in describing these functions. At the same time, we will need to fully grasp the syntactic properties of the sentence-types in question. Syntactic analyses will build on the syntax developed in 80-180 Nature of Language and additional courses covering syntax (depending on the experience of the participants).
Prerequisite: 80-180

80-284 Invented Languages
Intermittent: 9 units
Language is normally something that develops and and changes organically within human communities, without much in the way of organized design or invention. Over the centuries, however, many have succumbed to what J. R. R. Tolkien called the "secret vice" of language creation. The purposes of these invented languages have 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 of study language invention is thus both the study of a distinctive art form, and an exploration of the history of how people have thought about language in different ages and societies. In this course, we will explore the linguistic considerations involved in 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 invent 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
Fall: 9 units
This course is intended to provide an introduction to the methods of syntactic analysis, and to some major themes of contemporary syntactic theory, following up on syntactic concepts introduced in 80180, Nature of Language. A primary theme of the course is the structural constituency of a sentence, and the course will address some of the following questions. What are syntactic constituents? Do all aspects of syntax manipulate the same kinds of structural units, or do different grammatical processes rest on incompatible notions of constituency? How do other syntactic relations connect with constituent structure? To the extent that there is mismatch between different notions of syntactic structure, how can it be reconciled within a theory of grammar? These questions are engaged in through the diagnostics and 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.

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 lingusitics 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 morphology interacts with 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.
Prerequisite: 80-180

80-287 Historical and Comparative Linguistics
Intermittent: 9 units
This course provides an introduction to the study of language change. The languages we speak are always changing: over time, these small changes can accumulate into more significant ones, making it possible for very different languages to derive from a common linguistic ancestor. These observations immediately raise a number of questions. Which kinds of changes occur in the history of human languages? How can linguistic theory help us to make sense of these changes? What can we infer about the historical relationships between languages, and about unattested ancestors of known languages? In this course, we will explore techniques for addressing these questions, learning about some major themes and tendencies in sound change, grammatical change, and semantic change.
Prerequisite: 80-180

80-292 Learning Science Principles
Spring: 6 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. To waive an IDeATe portal course requirement, students should have prior project-based coursework in design, social science research methods, or interactive prototyping experience.
Prerequisites: 15-104 or 15-112 or 62-150

80-294 Ethics Internship / Practicum
Intermittent: 9 units
Internship

80-305 Choices, Decisions, and Games
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.
Prerequisites: 15-251 or 80-210 or 80-211 or 80-212 or 21-127

80-311 Undecidability and Incompleteness
Spring: 9 units
U & I focuses on two fundamental results: the undecidability of logic (established by Church and Turing) and the incompleteness of mathematical theories (discovered by Gödel). The proofs of these results required not only a novel metamathematical perspective, but also striking logical concepts and fascinating mathematical techniques. We begin by presenting (predicate) logic and strategic ways of constructing proofs; that is extended to a systematic development of elementary set theory and the formal representability of (informal) mathematics in set theory. With this basis, it is possible to show that set theory is incomplete. To show that logic is undecidable, a concept of computation is introduced via Turing machines. The three concepts - proof, set, computation - are fundamental, in particular, for mathematics and computer science. The undecidability and incompleteness results are among the most significant contributions of modern logic; 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 and discuss also historical and philosophical aspects of the subject.
Prerequisites: 80-310 Min. grade C or 21-300 Min. grade C or 80-210 Min. grade B or 80-211 Min. grade C or 15-251 Min. grade C

80-312 Philosophy of Mathematics
Intermittent: 9 units
The 20th century witnessed remarkable and novel developments of mathematics - with deep roots in the 19th century. The beginnings of these developments were beset with foundational problems and provoked a variety of programmatic responses: logicism, intuitionism, and finitism. For a deeper study of basic issues, we review a part of classical Greek mathematics (the theory of proportions) that is closely connected to the foundations of analysis in the 19th century. We analyze set theoretic and constructive approaches, and discuss fundamental metamathematical results and their philosophical implications. Against this background, the last part of the course will make explicit and analyze important aspects of mathematical experience.
Prerequisites: 80-311 or 80-211 or 80-310

Course Website: https://goo.gl/0fMpQQ

80-314 Logic and Artificial Intelligence
Intermittent: 9 units
Logic has played a central role in the development of artificial intelligence, and continues to do so today. The first half of the course will be on "classical" logical AI, starting with Newell & Simon's General Problem Solver and McCarthy's Situation Calculus, before moving on to more recent developments in default reasoning, logic programming, epistemic logic, and description logic. After discussing links between non-monotonic reasoning and probability, the second half of the course will focus on current attempts to combine logic and probability/statistics for AI applications, including Markov Logic, probabilistic programming approaches, and several others. We will highlight the logical aspects of these tools, and more generally discuss the role logic can play in modern AI. Philosophical issues in AI will also be discussed. Prerequisites: Background in both logic and artificial intelligence would be useful. However, a solid background in one but not the other should also be fine. We will assume basic (propositional and first-order) logic as well as basic probability.

80-315 Modal Logic
Fall: 9 units
This course is an introduction to mathematical modal logic and its applications in philosophy, computer science, linguistics, and economics. 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, study model equivalences and expressivity results, establish the finite model property, and discuss decidability and basic complexity results. We also consider topological semantics as an alternative to relational semantics, and investigate the connection between the two. Finally, we introduce modal predicate logic, incorporating first-order quantification into the system. In the latter part of the course we turn our attention to more specialized logical systems and their applications, as determined by the interests of the class. Topics may include: epistemic and doxastic logics, multi-agent systems and the notion of common knowledge (with applications to game theory), deontic logics, logics for reasoning about counterfactuals, temporal and dynamic logics, public announcement logic, justification logic, and others.

80-316 Causation Probability & AI
Intermittent: 9 units
In this course we will examine foundational questions about the concepts of causality and probability, how artificial intelligence techniques can be used to solve some of the computational problems presented by the use of probabilities and representations of causal relations, and how probabilities and representations of causal relations have been incorporated into recently developed expert systems. The foundational questions we will examine are: What do causal and probabilistic statements mean? How can probabilities and causal relations be inferred? Are there any axioms relating causal relations to probability distributions? What are the advantages and disadvantages of using probabilities as compared to alternative representations of uncertainty? We will then discuss recent developments in Artificial Intelligence (e.g. Bayesian networks) which have solved some of the long-standing computational problems associated with the use of probabilities and statements about causal relations. Finally, we will study in detail some expert systems, such as QMR and Pathfinder, which have incorporated these new techniques in order to perform medical diagnosis.
Prerequisites: 36-226 or 36-217 or 36-202

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 K3,2 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/txagIS 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. Knowledge of social science and/or statistics is not required, but is desirable.
Prerequisite: 36-201

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 use of "rationality" postulates, the foundation of the right to property, and measuring the success or failure of an economy.

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 endures 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 Research Ethics
Spring: 9 units
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.

80-334 Social and Political Philosophy
Intermittent: 9 units
Political philosophers are interested in whether, and to what extent, government use of coercion can be justified. This question involves many facets, including what gives the government the legitimate authority (if any) to coercively enforce the rules, what limits there are (if any) to the legitimate kinds of rules the government can enforce (and why), what obligations (if any) the government has to the citizens that are governed by its rules, and what claims (if any) citizens of a state can make upon one another. This course provides a systematic investigation of such questions as well as the concepts that are often appealed to in political theory, such as "justice," "equality," and "fairness." Readings will be comprised of classic and contemporary theorists from within the liberal political tradition as well as theorists critical of this tradition and its ability to live up to the lofty ideals it espouses.

80-335 Deliberative Democracy: Theory and Practice
Intermittent: 9 units
Over the past 20 years, deliberative democracy has emerged as a major political theory. As a theory, it has also influenced the development of a number of grassroots organizations such as EveryDay Democracy and has led to a number of democratic innovations, such as Deliberative Polls®. This course will look at the history and concepts that form the background for the theory of deliberative democracy. We will also explore the connection between the theory and its practical applications. Finally, we will see how the theory and practice of deliberative democracy can work at the local, state and national level. Examples will be drawn from Campus and Community Conversations as well as larger initiatives designed to inform public policy in areas such as same-sex marriage, climate change and the issue of abortion in America.

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 focus, first, on the notion of legitimacy: What makes the coercive imposition of law backed by force legitimate? Under what circumstances, and why, are we obliged to obey the law? What is the proper scope for legitimate law? If the legal system lacks features that are essential for legitimacy, what (if anything) does that license us to do? We will also look at the connection between morality and the law, and ask to what extent our legal system should be informed by, or divorced from, morality. Finally, we will examine the concept of punishment: What are we doing when we punish someone for violating the law? How ought punishment to be used within a legitimate legal system? What should our response be to a system of criminal law that exceeds the bounds of legitimacy?

80-337 Philosophy, Politics & Economics
Intermittent: 9 units
The course is split between two broad topics. First, we explore issues pertaining to Individual Decision Theory, mainly the postulate of rationality and its implications. We then proceed to discuss collective decision making by a group of rational agents. We discuss methods of aggregating individual preferences and, in particular, measures of social welfare, in an effort to associate the evaluation of policy with ethical principles.

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) applied ethics, 2) management 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 and evaluate 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 Development and Human Rights
Fall: 9 units
Approximately 1.1 billion people live on less than $1 a day 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. Section B: This course aims to introduce students to the problem of global distributive justice and its intersection with global public health. 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? Section W: This course examines the question of what, if anything, we in the technologically and economically developed world owe to the global poor. It therefore focuses considerable attention on competing theories of global distributive justice and the relationship between poverty, poor health, and human rights. We will critically examine different strategies for international development that emphasize one or more of these variables and we will consider how information about the complex interrelationship of these variables should be factored into the development process.

80-358 Hume
Intermittent: 9 units
This course will investigate the philosophy of David Hume. We will focus on his philosophical thought expressed in the book A Treatise of Human Nature. Hume was an influential philosopher who wrote on many issues ranging from skepticism, to ethics, to 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.

80-365 Ramsey
Intermittent: 9 units
Frank Ramsey played a crucial intellectual role in the Cambridge of Russell, Moore, Wittgenstein and Keynes (just to mention some central figures of the exceptionally lively and creative atmosphere of Cambridge at the beginning of the past century). During his short life (he died in 1930 at the age of only 26) he made decisive contributions to epistemology, decision theory, philosophical and mathematical logic, philosophy of mathematics, metaphysics and philosophy of science. Just to mention an example, his paper `Truth and Probability' laid the foundations of the modern theory of subjective probability and also those of modern utility theory and decision theory. The entire core of Ramsey's philosophical and scientific work consists of no more than 15 papers. But in all cases they are remarkable essays that changed the intellectual topics they touched. Moreover they all contain the same view of philosophy merging a sound portion of Moorean realism with Ramsey's kind of pragmatist philosophy. The course reviews these central papers and its rich relations with the Cambridge philosophers of this time and the Vienna Circle. In addition it is remarkable that most of Ramsey's views remain valid today almost a century after his death. So, the course considers as well the impact of Ramsey's views in contemporary analytic philosophers and those influenced by early American pragmatism. The Ramsey Collection at the University of Pittsburgh comprises an almost complete collection of autograph material by Ramsey, roughly 1.500 autograph pages in all. I am doing some historical research on this material which I intend to incorporate as additional material for the course.

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
There is a robust interplay between the study of language in philosophy, and the study of meaning in current linguistics. Many of the foundational concepts on which linguistic semantics and pragmatics are based were developed by philosophers, or have been examined and critiqued by philosophers. In the other direction, some philosophers have adopted linguistic theories and methodologies in pursuing philosophical questions about language. This course will examine a sequence of topics in linguistical philosophy and philosophical linguistics. The primary focus will be on exploring the philosophical foundations of current work in linguistic semantics and pragmatics. Rather than presenting a standard survey of classical work in the philosophy of language, the course will focus on philosophical work which is of relevance to the practice of linguistics today. The course will involve detailed reading of papers taken from the literature, some of them of a technical nature. All relevant concepts will be explained, but students need to be willing to grapple with difficult material. The course can be taken as a stand-alone course, and no special knowledge of linguistics will be assumed. However, the course may be of particular interest to students who have taken or are taking courses in semantics and pragmatics, and wish to deepen their understanding of fundamental concepts in those domains. In general, the course should be of interest to any students who would like to understand the foundations of current approaches to the systematic study of linguistic meaning.
Prerequisites: 76-101 or 80-100

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 skills developed in that course, while delving more thoroughly into various issues central to phonology. We will focus primarily on consonants and the phonetic principles that govern their realization, with a special emphasis on voicing. We will learn about how articulatory and acoustic principles give rise to voicing assimilation, final devoicing and the interaction of consonant voicing and tone. The exploration will be hands on, and we will learn how to measure voice onset time, analyze stop bursts and fricative noise and see how the voicing of a consonant affects the pitch of the following vowel, using Praat. On the phonological side, we will consider various ways in which voicing contrasts and processes have been represented, including SPE-style binary features, feature geometry and Optimality Theory. One of the central themes will be how to reconcile phonological accounts of voicing phenomena with our understanding of their underlying phonetic principles. Both rule-based and constraint-based approaches to phonology rely on discrete symbols, whether they be phones or features, but the speech stream is not neatly divided into segment-sized units, and the features of phonological theory are typically spread over multiple segments. Additionally, many phonological explanations recapitulate phonetic principles, calling into question what we consider to be an explanation of sound patterns. The course will culminate in a survey of some recent approaches to understanding how phonetics and phonology interact.
Prerequisites: 80-282 and 80-180

80-383 Language in Use
Intermittent: 9 units
The meaning of a sentence depends only on the meanings of the words it contains, and how they are put together in a syntactic structure. But the meaning of an utterance "a linguistic expression produced by a speaker in a particular context" depends on both sentence meaning and on features of the context and of the discourse itself. This course focuses on the analysis and description of utterance meaning. We will develop a treatment of context as a linguistically relevant notion and explore how linguistic analysis can be expanded from the domain of the sentence to the domain of connected discourse. In addition, the course will be concerned with the treatment of linguistic items (words and constructions) whose meaning can only properly be characterized in terms that make essential reference to context, to ongoing discourse, or to the speaker.
Prerequisites: 80-100 or 80-180

80-384 Linguistics of Turkic Languages
Intermittent: 9 units
In this course we will look at the phonology, morphology, syntax and writing systems of languages within a single language group, Turkic. Turkic languages are spoken across continental Asia and include such languages as Turkmen, Tatar, Kazakh, Kirghiz, and Uzbek. In this course we will concentrate especially on Turkish, Azerbaijani, and Yakut. We will look at the sound systems of these languages to discover how they are related, and we will also look comparatively at various morphological and syntactic structures. We will consider the impact of diachronic factors on the synchronic study of language, and we will also examine certain recent techniques used to establish genetic relations between languages. To a large extent the course will be student-driven, and it can be seen as an extended case-study for applying concepts and analytical strategies taught in Nature of Language, Phonetics and Phonology, Linguistic Analysis, 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

80-405 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'll 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: 80-311 or 80-310 or 21-300

80-413 Category Theory
Intermittent: 9 units
Category theory is a formal framework devoted to studying the structural relationships between mathematical objects. Developed in the mid-20th century to attack geometrical problems, subsequent progress has revealed deep connections to algebra and logic, as well as to mathematical physics and computer science. The course emphasizes two perspectives. On one hand, we develop the basic theory of categories, regarded as mathematical structures in their own right. At the same time, we will consider the application of these results to concrete examples from logic and algebra. Some familiarity with abstract algebra or logic required.

80-414 Seminar on Computability
Intermittent: 9 units
This interdisciplinary seminar is divided into three parts. Part 1 reviews the emergence of the computability concept and arguments for Church's or Turing's Thesis; it presents then, in sharp contrast, an axiomatic characterization of serial and parallel computability. Part 2 takes up the considerations of Gödel, Turing and Post to relate machines and the human mind, in particular, with respect to mathematics. Finally, Part 3 discusses the use of computations in cognitive psychology to model aspects of human minds; the focus is on (Post-) production systems and parallel-distributed processes.
Prerequisite: 80-311

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 winner 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.

80-447 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. The students develop an original research report based on both archival and contemporary policy analysis and they present their results to a client organization in the community.

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
The "linguistic turn" in twentieth century philosophy lets us think about mathematics as a collection of linguistic rules and norms that helps us reason effectively and make sense of our experiences. The advent of computational proof assistants, which use stylized languages to convey mathematical content, provides new perspectives on these rules and norms. This seminar will explore ways these formal models of mathematical language and inference can be brought to bear on traditional questions in the philosophy of 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 functorial 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 functorial from classical semantics. Such categorical models occur, for example, in denotational semantics. e.g. treating the ambda-calculus via the theory of cartesian closed categories. Higher-order logic is treated categorically by the theory of topoi. In particular we will cover the notion of "realizability topos", which is a category theoretic incarnation of the realizability technique from proof theory. A prerequesite for this course if familiarity with basic category theory (as treated e.g. in Steve Awodey's "Category Theory" textbook), but depending on demand the course can start with a quick refresher of the central concepts.

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 theories that highlight violations of the sure-thing principle — violations of Savage's postulate 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).

80-516 Causality and Learning
Fall
Causal connections are usually more informative and helpful than associational information, especially in understanding, control, decision-making, and prediction in changing environments. In the past decades, interesting advances were made in machine learning and statistics for tackling long-standing causality problems, such as how to discover causal knowledge from purely observational data and how to infer the effect of interventions using such data. Furthermore, recently it has been shown that causal information can facilitate understanding and solving various machine learning problems. This course explores how causality is different from and related to association, recent machine learning methods for causal discovery, and why and how the causal perspective helps in machine learning.

80-518 Seminar on Topics in Logic
Intermittent
Topic: Intuitionism and Constructive Mathematics In this seminar we shall read primary and secondary sources on the origins and developments of intuitionism and constructive mathematics from Brouwer and the Russian constructivists, Bishop, Martin-Löf, up to and including modern developments such a homotopy type theory. We shall focus both on philosophical and metamathematical aspects. Topics could include the Brouwer-Heyting-Kolmogorov (BHK) interpretation, Kripke models, topological semantics, the Curry-Howard correspondence with constructive type theories, constructive set theory, realizability, relation to topos theory, formal topology, meaning explanations, homotopy type theory, and/or additional topics according to the interests of participants.

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
Seminar on Philosophy of Science: Estimating Brain Mechanisms from fMRI Imaging What does the brain do when we are doing things—or not? Fundamental answers are molecular processes; less fundamental are intra and inter neuron processes; less fundamental still are what the smallest collections of neurons that "functional" imaging can resolve—voxels—are doing; and still less fundamental are what collections of voxels are doing. "Doing" means what features of the environment the neurons, or clusters of neurons respond to, or what behaviors they produce, or what causal relations they have with one another. This seminar will focus—not exclusively—on the last, and particularly on how, if at all, those causal connections can be discovered from fMRI time series.
Prerequisites: 80-413 or 80-713

80-521 Seminar on Formal Epistemology
Spring
This seminar focuses on epistemic logic, with particular emphasis on topological representations. No background in topology is necessary, though some familiarity with modal logic will be very helpful. The format is presentation-style: each student will be expected to prepare (in consultation with the professor) and present approximately two papers over the course of the semester. We will tackle a series of topics, beginning with foundational and introductory works and progressing to articles of current research; topics will include general modal logic, epistemic/doxastic logic, topological semantics, subset space semantics, and public announcements. Additional topics will be chosen based on the interests and suggestions of those in the seminar.

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., Arrovian 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 especial attention to the neorepublican notion of freedom as non-domination, how 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.

80-580 Seminar on the Philosophy of Language
Intermittent: 9 units
Seminar on Coherence The goal of this seminar is to explore models of coherence in the linguistic and cognitive realms, drawing on work in those areas and also in machine learning, Bayesian decision theory, formal epistemology, and other computational frameworks. The model (or models) we will develop will be informed by the effects of coherence constraints in linguistic interpretation and in cognition. In the linguistic realm, interpretation typically involves constructing representations that are richer than the content that is linguistically encoded, and this enrichment is plausibly the result, in part, of the expectation of coherence. This expectation has far reaching effects, including on the assignment of referents to pronouns, the interpretation of definite and indefinite noun phrases, assignment of temporal relations, and the identification of Gricean conversational implicatures. In the cognitive realm, coherence is widely recognized as a factor in various learning & reasoning processes, including conceptual integration, belief adjustment, sequential decision-making, and even less rational processes such as rationalization. In the first part of the seminar, we will develop an understanding of the linguistic and cognitive phenomena relating to coherence in its many manifestations. In the mid-part of the seminar, students will present models and frameworks of coherence from other fields, and examine ways to model various linguistic and cognitive phenomena using these approaches. In the concluding section of the seminar, we will focus on particular linguistic/cognitive phenomena and try to modify the various models to (hopefully) find characterizations and explanations of the diverse phenomena.

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.