USNA 204. The Evolution of Scientific Ideas. 3 Units.
Scientific understanding has evolved over the years. There are very few beliefs about the natural world that have remained intact over the past few centuries, or even the past few decades. The chief goal of the course will be to give students an understanding of how scientific ideas change and how newer ideas supersede the old. Questions to be investigated include: What is Science? How do disciplinary scientific communities (physicists, chemists, biologists, etc.) form and identify themselves? How does the community of scientists within a discipline come to a consensus that it is time to adopt a new paradigm: What scientific, social, political, and cultural factors come into play during the periods of transition? The course will be in seminar format. The students will be given opportunities to explicitly develop critical thinking skills (the specific skills to be developed will be selected by the class from an explicit list) and writing and speaking skills. Class meetings will be used to share their research results and to study the assigned texts and papers. The students will be required to demonstrate their understanding in a variety of ways. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 211. Einstein, Space and Time. 3 Units.
This course will explore the profound changes in our conception of space and time brought about by Einstein’s theories of special and general relativity. As a University Seminar, it will also integrate writing and discussion about these topics into the class and explore the philosophical and technological context in which the ideas were developed. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 216. Fuel Cells--Reality, Prospects and Myth. 3 Units.
Fuel cells have been recently identified as a key source for non-polluting, oil-independent energy in the future. In this course, we will study and critically analyze the prospects, barriers, and impact of broad implementation of fuel cells, focusing primarily on the transportation sector. Major topics of the course include: (i) World and U.S. energy outlook; (ii) Potential role and impact of fuel-cells, their advantages, limitations and prospects for improvements; (iii) Alternative fuels--source, availability, distribution and cost; (iv) Potential political, public policy, economic, and environmental impact of large-scale implementation of fuel-cells technology. The course is designed for students from all disciplines. Students will be expected to read assigned texts and articles and critically analyze statements and points of view presented. Quantitative analysis is expected where appropriate. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 220. Suburban Landscapes: Nature, Technology, and Culture. 3 Units.
This course will examine suburban neighborhoods by focusing on the design of technology and nature in these spaces. The way that people understand and operate in the world is so entangled with values and assumptions that the physical shape of the world cannot be separated from human culture. In this sense, suburban landscapes are not simply neighborhoods but also examples of culture. The form of the land and the technologies in the suburbs are continually reshaped to correspond with the cultures of the people occupying those spaces. By studying suburban landscapes we can see how the ideas in people's heads become part of the physical world in which we live. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 223. Critical Science Fiction. 3 Units.
The emphasis of this seminar will be on developing skills of critical analysis of science fiction. A goal of the course is that the students will be able to distinguish plausible from impossible when they read their next science fiction book or watch a sci-fi movie. Upon completion of the course, the students should be well equipped to recognize scientifically unrealistic assumptions and statements in pseudoscientific books, movies, TV programs and other mass media sources. The course will be sufficiently flexible to allow coverage of topics that are proposed by, and interesting to, students, or the topics which would arise during discussions. The course will encourage open-minded approach to understanding controversial areas, as well as emphasize the great achievements that humankind made in the short historical period of our civilization. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 224. Food, Farming, and Economic Prosperity. 3 Units.
Intended to challenge conventional thinking about "progress", this course will examine the evolution of food production and consumption in the U.S. over the past 50 years. We will begin with the topic of food, itself. We will explore fundamental questions such as, What is food? Why should we care? Where does food come from? Why does it matter what we eat, and equally important, what we eat eats? Students will explore their own eating habits by keeping a journal of what, when, where, and how they eat. Discussions will focus on the social, cultural, nutritional, and technological aspects of food. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 226. Evolution of Human Behavior. 3 Units.
Human behavior is a result of the complex interplay between our genes and the environment, both of which have been shaped by evolutionary forces over millions of years. To what extent does natural selection shape our behavior today? Are humans naturally monogamous? Why do conflicts arise even in our most intimate relationships? Is human behavior ultimately in the service of reproductive success, ensuring that our genes are passed into the next generation? This course reviews the history of evolutionary theories of mind and behavior, as well as current ideas about the ecological and genetic components of behavior. We will examine key principles of neurobiology, sociobiology, and evolutionary psychology to critically evaluate evolutionary interpretations of human behaviors, including those comprising cultural traditions and social institutions. Specific topics to be addressed include human mate choice, parenting strategies, interpersonal conflict, and altruism. The course is structured as a seminar, with emphasis on discussion and formation of logical arguments. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 228. Time. 3 Units.
This seminar course will explore the nature of time from many stances, including those of Psychology, Biology, Technology and Philosophy. Yet time is central to Physics, and in Physics we will orient our explorations of time. Our understanding of time has sharpened a great deal in the last few centuries, the most obvious markers being Newton's Absolute time, which remains entrenched in modern culture, and its subsequent physical overthrow by Einstein's relativity. Given the physical primacy of Einstein's time, many questions arise: How malleable is the concept of time? Is there a fact of time? Can the present be defined? The past? The future? The successes of modern Cosmology lead us to ask: Was there a beginning of time? Will time end? The symmetry of fundamental physical laws with respect to the direction of time, counterpointed by asymmetric phenomena, lead to: Is there a master arrow of time? Is the flow of time an illusion? In this course we will investigate what "Time" is telling us about the natural world and ourselves. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 237. Landscape History and Conservation. 3 Units.
Human history is intimately intertwined with the natural landscape on which it occurred. From coastal preserves and their beach communities to Midwestern farmland and the preserved site of Thoreau's Walden Pond cabin, and at places like the Grand Canyon, the American landscape itself holds many clues to our country's natural, ecological, and cultural history. This course will investigate the lived landscape in two ways (which have a multitude of shades to them): as a place where humans shape the natural for their own memorial, productive, and aesthetic uses, or as a natural place that humans set aside or conserve. We will read landscape history and conservation theory, and we will consider global practices of conservation through UNESCO's World Heritage Sites. Class work will entail a process-oriented project on the Cleveland landscape, which students are encouraged to approach through the lens of their major. We will visit the Wade Oval and the cultural gardens of Rockefeller Park as an example of current conservation practices working to protect the natural and cultural value of the local landscape. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 240. Technologies of the City. 3 Units.
Based on the premise that cities are never "finished," and constantly being remade, the University Seminar, Technologies of the City, will look at the technological and cultural history of cities from the ancient world to the present day. Students will explore the history of building materials—wood, brick, steel, concrete, and glass—used in the construction of cities. We will also trace the development of city infrastructure such as electricity, water and sewage systems, streets, bridges, and subways. Technological innovations, such as the automobile, will receive special consideration. We will move moth geographically and temporally to visit the world's great cities, studying examples of significant building projects, such as the Brooklyn Bridge, the Chicago World's Fair, and Cleveland's first skyscraper, the Rockefeller Building. The course will cover the history of the professions—engineering, architecture, and urban planning—that have contributed to the construction of cities, and will review the works of these practitioners, as well as that of artists, reformers, and utopians that have imagined new directions for the city. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 247. Epidemics in Human History. 3 Units.
This course will examine the role of epidemics (of all types) in human history. Disease has shaped our society in many ways and continues to do so. Despite the plethora of antibiotic and antiviral drugs since 1940, 90% of the decrease in (First World) infectious disease is due to simple public health measures and better hygiene. But overuse of antibiotics increasingly is causing the rapid evolution of "superbugs" that threaten new plagues and epidemics. Both historical and modern epidemics of plague, smallpox, Salmonella, cholera, tuberculosis, and HIV/AIDS will be examined. The interaction of these epidemics with societies and how the epidemics influence society, cultures, art, and literature will be major topics of discussion. The course is primarily discussion with short student presentations. In addition, 3-4 short "Front Lines" talks by and discussion with CWRU and University Hospital clinicians will explore today's realities of epidemics, infection, and antibiotic resistance in the United States, Uganda, South Africa and elsewhere. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 249. Restoring the Great Lakes: Opportunities and Challenges. 3 Units.
This seminar will focus on the issues and methods of restoring the Great Lakes, with particular emphasis on public action and decision-making processes. Students will learn about the environmental history of the lakes, as well as current challenges to improving water quality and related aspects of the ecosystem. Technical experts, field trips, and other informational resources will enable seminar participants to engage in lively debates on the best ways to address those challenges. Opportunities for observation of and/or direct collaboration with key stakeholders in the restoration process will enhance students' understanding of the processes by which key environmental decisions are made and implemented. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 252. The Future of Food. 3 Units.
Since World War II, science and technology have transformed the way Americans produce and consume food. This transformation has been supported by government policies and accomplished through the application of industrial methods in agriculture, food processing, and food delivery. Such methods have allowed a tiny fraction of the American population to produce vast quantities of food products at very low prices for American consumers. But this American diet, while inexpensive, has turned out to be high in sugar, fat, and processed grains that are contributing to chronic disease such as diabetes and obesity. In addition, environmental impacts of confined animal feeding operations, vast monoculture grain production, and global food transport are raising questions about the sustainability of American agribusiness. This seminar will explore the evolution of food production in the United States since World War II and ask the question: is it possible to nourish the world’s population using nutrition and flavor as guiding principles rather than cost? What is the true meaning of "sustainability" in agriculture? The last third of the course will be devoted to creating a plan for using part of the University Farm to grow food for the University. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 258. Designing Urban Green Space. 3 Units.
In this course, we will investigate the history, theory and practical design of green space in cities. We will focus on types of green space and their community function, relationship to commerce, aesthetics, recreation, ecology, and health in particular. Students will engage in group projects where they locate all underused space in Cleveland (vacant space, gray or brown fields) and will propose a new use for it as green space of some kind. Individual research projects will be related to that site. Lively class discussion and frequent reading responses required. Mandatory field trip to sites in downtown Cleveland. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 259. Bring Out Your Dead. 3 Units.
This course examines the interplay between history and plague outbreaks. Course readings draw largely on the writings and experiences of scientists, physicians, and public health officials. By taking a historical approach to the study of the relationship between human history and the history of disease, students will learn about the development of the scientific method (namely the slow process by which humans learned to identify, categorize, and respond to disease), how science develops in specific historic contexts, the consequence of scientific inquiry, and what humans do when they are faced with imminent death. A tentative list of plagues includes: the Athenian Plague, Black Death, Yellow Fever, TB, Malaria, Influenza in 1918, and AIDS. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 260. Life in the Past. 3 Units.
This course will focus on how we learn, discover, and make conclusions about life in the deep past. What types of life were present? And how can we understand their extinction? A principal focus will be how extinctions in North and South America have affected both the land and its animals and, consequently, the course of human development. We will look at megafauna from the local area in conjunction with the "Extreme Mammals" exhibit at the Cleveland Museum of Natural History, read about the fossil boom, study the Dodo, and look at scientific ways in which animals are currently being completely re-imagined via technology (computer bone/muscle articulation, eating habits, climate models, etc.). We will also look at the cultural ways in which we view these "dinosaurs" (movies, children’s books, museum exhibits) and see if it helps or hurts our scientific and historical understanding of them. At heart, our main question will be: can you really understand a time, space and creature that has been extinct for millions of years? How? Why? And why do these "monsters" hold such fascination for us? Does their disappearance bode well of the human race? Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 262. How I Learned to Love The Bomb. 3 Units.
In this course, we will explore the development of the atom bomb and its historical ramifications. Our guides through this history will be the scientists themselves. Our goal will be to understand their work as well as their motivations, travails, internal conflicts, and the consequences of their achievement. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 265. Thinking National Parks. 3 Units.
This seminar provides students an opportunity to explore U.S. national parks and their history of displaying both nature and culture. This discussion-based, writing- and research-focused class requires students to examine a park system that is both extraordinarily popular and ripe with controversy. We begin with several recurring questions: Where did the national parks idea come from? How has the park mission evolved and adapted? Can parks be "read" as texts, and if so, how does our point of view determine what we see? How do parks arrange displays of cultural and natural worlds, and how do they display interactions therein? How can changing park philosophies be reflected in their physical apparatus and infrastructure? Students will participate in regular class discussions, occasionally lead these same discussions, complete formal writing assignments, and develop a final research project. The course readings will alternate between historical and present-day selections, so that we explore the history of U.S. national parks while simultaneously considering challenges and controversies that matter very much today. Early readings will include John Muir and Gifford Pinchot; current trends will be explored in the writings of William Cronon, Alfred Runte, and Jennifer Price, among many others. We will view significant portions of Ken Burns' recent PBS series The National Parks: America's Best Idea. The ultimate "text" for the class, however, is an actual national park. Each student will choose a national park as the basis for their semester-long project. Students will begin with description and history of their park, and then they will explore controversies or other issues in the park, developing their own argument. Next, students will have a chance to play architect/landscaper/park-superintendent, as they propose a change to the park that would address an existing problem or enhance the visitors' experience. Finally, students will gather these pieces into a single coherent project, submitting a 10-15 page final essay as well as producing an engaging class presentation. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 266. Life After the Death of Print. 3 Units.
Around 1439, Johannes Gutenberg invented the moveable type printing press, a technological development that altered the world by ushering in an era of mass, reproducible communication. For nearly 500 years, print technologies have dominated communications. Scholars have shown that print's ability to disseminate information led to revolutions in art, science and politics. In short, print technologies have largely defined what it means to be a thinking and communicating human being. The emergence of digital technologies has altered communications in ways that are only now being understood. This course examines how developments in digital technologies impact communication practices by threatening print's historic stronghold. Consequently, the course also explores what impact new technologies have on human identity. We will consider the historical development of display technologies (printed materials and digital screens) to understand what is at stake in the move from print to digital communication. We will then investigate current phenomena associated with Web 2.0, including blogs and social networks, in order to understand how our communication choices construct and allow for our public and private identities. Additionally, the course will examine new display technologies, such as iPhones and Kindles, that allow for the possibly constant dissemination of those identities. Finally, we will hypothesize about how digital technologies force us to conceive of human identity differently from the ways that print invites. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 270. Alternative Energy Sources. 3 Units.
Alternative energy sources are needed, because of limited fossil fuel resources, increased demand, and environmental impacts. This course will deal with the issues of alternative energy sources. Various sources such as solar (thermal and photovoltaic), hydroelectric, wind, geothermal, ocean thermal, wave, tidal and geothermal energy, as well as energy from biomass will be discussed in order to determine what is practical on a large scale, as well as on the scale of the individual homeowner. We will pay attention to the efficiency of each alternative energy source as well as what limitations exist in terms of extracting useable energy. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 271. Gene, Environment and Behavior. 3 Units.
The goal of this course is to encourage students to be well informed and critical consumers of the media reports about the influence of genes and environment on human behavior. This course involves the book by Matt Ridley titled, "Genome: The autobiography of a species in 23 chapters." Ridley has a Ph.D. in zoology, worked as a journalist, science editor, and national newspaper columnist. The book devotes a chapter to each pair of human chromosomes. Each chapter focuses on the role of a gene. Ridley's book was published in 1999; therefore, students will conduct their own research to update each of the chapters in Ridley's book. The first few weeks of class will be used to provide a background on genetics research through field trips and guest lectures from CWRU genetic researchers. We will have several writing workshops spread throughout the semester to offer "Just in Time" tips needed to write critical evaluations and literature reviews. Each student will present twice during the semester. The first oral presentation will revolve around a summary, critical evaluation, and an update of the human trait presented in the Ridley book on their assigned chromosome. The presentation will be about 15 minutes with 5 minutes left for questions. Students not presenting will be assigned one of the three chromosomes (chapters) covered that day and they will each write a seminar question to pose to the class. In addition, each student will also serve as a reviewer for one of the presentations to provide constructive feedback to the presenter. The second presentation will consist of new material found by each student about genes on their chromosome. They must find another trait on their chromosome and present the most current information available on that trait. In place of a final exam, each student will turn in a research paper on their assigned chromosome. We will build these papers throughout the semester with a series of graded "checkpoint" assignments. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 272. The Thames Watershed. 3 Units.
In this seminar, we will investigate the London, England-area Thames watershed and its associated concerns, like urban development, watershed management, aquatic species conservation, and habitat engineering and restoration. A critical part of this seminar will be a spring break field trip to London. On the field trip, we will focus on London’s rivers and their history and ecology. We will study the Lea River Valley (where the 2012 summer Olympic Village is located), the Fleet River and various water-related constructions, such as Docklands, Regent’s Canal, and the Wildfowl and Wetlands Nature Reserve, each from historical and ecological standpoints. Emphasis will be on how humans have treated the watershed historically, from using the rivers as sewers and transportation links, to restoring their ecosystems, as is the current case in the Lea River Valley. Course readings will be a mix of cultural history, London newspapers archives, and scientific studies on riparian corridor management. Students will keep field journals in London and will write an experiential learning essay about how the field trip intersected with the readings we’ve discussed in the seminar. They will also write a 10-12 page research paper on one of the ecological issues witnessed in London and its significance. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 274. Science and Religion. 3 Units.
Commentary on the relationship between science and religion tends to take one of the following perspectives: (1) science and religion are incompatible; (2) science and religion are compatible; (3) science and religion are not fundamentally different kinds of things. This class will critically examine each perspective by looking at the history of the relationship between science and religion and the philosophical issues that have arisen therein. We will then use what we have learned to see if we can make progress on contemporary debates surrounding science education. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 283. Cultures of Science. 3 Units.
From the laboratory to the museum, science is a dominant way in which we make sense of the world. This seminar examines the cultures of science. Drawing on the fields of anthropology, sociology, history, and science and technology studies, we explore the interplay, exchange, and fertile ground between “culture” and “science.” We analyze the cultural practices of scientists, the relationship between scientific and indigenous ways of knowing, and ethics of scientific knowledge, as well as scientifically mediated understandings of personhood, nation, legality, and truth. We will consider case studies from the U.S., Latin America, Europe, Africa, and Asia that reflect on contemporary intellectual debates and public concerns. The course considers the following questions: Is science cultural? What does objectivity mean? How are scientific facts produced? Do our understandings of citizenship and the nation have any connection to science? Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 285. The Science of Madness: An Historical Investigation of Mental Illness. 3 Units.
Since antiquity the western world’s understanding of mental illness has continued to evolve. This course will examine the trajectory of that evolution, looking at the medical theories that have influenced assumptions about the causes and treatments of mental illness from the early modern era through the twenty-first century. Examples of questions we will investigate include: How we have defined the normal and the pathological in human mental behavior over time? How do we explain the centuries-old correlation that medicine has made between creativity and mental illness? Which past and present psychiatric treatments have been beneficial and which harmful? How did Darwin’s theory of evolution affect theories of mental illness (and how does it continue to do so with the advent of evolutionary psychology)? How have changing philosophies of science affected the research and practice of psychology? How and why do the sciences of the mind—psychiatry, psychoanalysis, clinical psychology, psychopharmacology, the cognitive neurosciences—claim so much scientific authority and exert influence over our lives today? As a frame work for this inquiry, the class will use the concept of paradigm shifts as Thomas Kuhn defines in his classic work, the Structure of Scientific Revolutions. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 286. Science and the Paranormal. 3 Units.
From paranormal television programs to the academic study of parapsychology, claims about the “science” of the paranormal abound. This seminar examines the ways in which people have attempted to scientifically explore questions of life after death, the soul, and anomalous phenomena such as ghosts, telepathy, and ESP. The seminar begins by exploring the emergence of psychical research and parapsychology in the late nineteenth century. We then critically analyze a variety of purportedly scientific approaches to the paranormal and analyze their understandings of nature and science. By exploring the claims of paranormal researchers, parapsychologists, and fringe scientists, we will analyze the constitution of science and its demarcation from pseudoscience. We consider a variety of methodological and heuristic tools to distinguish science from non-science such as falsifiability and Occam’s razor and apply them to paranormal claims. We also analyze the criticisms leveled at paranormal research. We ask the following questions. What is science? What distinguishes it from “pseudoscience” or non-science? What is skepticism? Can there be a science of the paranormal? What understanding of the natural world is the paranormal grounded on? What is the relationship among science, religion, and belief? Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 287A. Perspectives on the Cosmos: From the Ancient Philosophers to Modern Science. 3 Units.
For all of recorded history, and presumably well before that, people have asked the Big Questions: What is the nature of the Universe? How big is it? How old? What is our place in it? For just as long, we've been making up the answers. Cosmology is the subject that seeks to answer the big questions. As such, it is the nexus where science, philosophy, and religion collide. This course will explore the subject of cosmology, from both an historical and scientific perspective. In the process, we will examine the roles of faith, philosophy, and empirical knowledge. We will survey prevailing beliefs towards the nature of the world model over time, examining the impact of belief systems on the interpretation of physical evidence. Subjects to be covered include the first vital steps of the ancient philosophers, the tension between geocentric and heliocentric world models at the time of Copernicus and Galileo, and the modern scientific world view. Students will learn to critically examine evidence and its interpretation, and to appreciate the strengths and shortcomings of various forms of human knowledge. Emphasis will be placed on the importance and limitations of empirical evidence and the dangers inherent in the interpretation of evidence within a preconceived framework. The student will gain an appreciation for the historical development of world models, culminating with modern cosmology. In the process comes a respect for the diverse paths to knowledge followed by humanity. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287B. Electrical and Electronic Devices in Our Lives. 3 Units.
Electrical circuits and embedded microprocessors control a great many aspects of our daily life including the power grid, medical devices, consumer electronics and infrastructure. This seminar will introduce students to electricity, electrical circuits, measurement, the Arduino microprocessor development platform, the engineering design process and how the above devices work. Laboratory time will allow students to create circuits and programs to interact with and control some aspect of the environment. As part of the course, students will examine how simple errors encountered during laboratory work compare to the errors and oversights which have caused disasters. A project will ask students to design a simple device to address a problem or need and will provide the foundation for writing assignments at the end of the course. Students will make use of the Sears Design Laboratory and the Think[Box] facility. This course cannot be taken by students who previously took FSNA 137 Volts, Amps, Bits and Bytes. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287C. Animals and Humans: Making Sense of the Human-Animal Bond. 3 Units.
Humans have an incredibly complex relationship with (non-human) animals. We eat some animals and consider other animals members of our family. We worship some animals and vilify others. This class examines the complexities of our relationship with (non-human) animals. Through exploring human emotional, practical, and epistemological ties with animals, this course examines what it means to be animal as well as what it means to be human. We analyze the following questions. How do we come to know and understand animals? What are the issues surrounding the use of animals in scientific speculation, classification and experimentation, such as vivisection, cloning and the human-animal relationship in technoscience? Do some non-human animals possess material culture, social morality, and emotions such as grief and sadness? Why do animals populate our popular culture and art? Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287D. Native American Environmentalism: Sustainability and Contemporary Energy. 3 Units.
This seminar course will focus on three main areas of Native American environmentalism. First, we will learn about Native Cosmologies and historical connections to the land while exposing the controversial relationship of Native Americans to land and wildlife within the myth of the "ecological Indian." Second, we will examine how Native Americans have responded to toxic pollution of indigenous lands as a result of manufacturing and uranium mining, which some refer to as "environmental racism." We will also learn about tribes who choose to host nuclear waste facilities as an exercise of their sovereignty and as an avenue of economic development. Finally, we will investigate initiatives by tribes and coalitions in land and water stewardship, investment in "new" energies and technologies, sustainability of lands (prairie and forest restoration), reclamation of waterways (dam removal), and wildlife management, to name a few. Students will inform their critical thinking about Native American environmentalism with a variety of texts and websites of scholarly and public opinion, scientific data, native knowledge, and historic fact. The seminar will include collaborative learning and presentation projects in which students will pursue research topics related to energy development, stewardship and sustainability, or wildlife management and harvesting. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287E. Evolution and the Modern World. 3 Units.
Modern evolutionary theory has influenced all aspects of biology and the clinical sciences. It has, moreover, resulted in novel ways to think about many of the social sciences. This class will focus on how the concept of evolution has dramatically altered the way we view human anatomy, physiology, and behavior. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 287F. Environment and the Fates of Societies: Guns, Germs, and Steel. 3 Units.
This University Seminar deals with the connections between human societies and landscape, climate, pathogens, and plant and animal species. The main method for this exploration is a close reading of Jared Diamond’s Guns, Germs, and Steel. Diamond explains that Western Europeans came to occupy and dominate large areas of the globe because of natural resources present in certain regions of the Old World since the end of the last Ice Age. For example, Diamond studies ancient patterns of plant diffusion or the place of mountain ranges and deserts in the development of technologies. Seminar participants will also study historical sources from specific times and places - namely North America from European contact to 1850 - and compare them to Diamond’s general environmental explanations and models. Placing Diamond’s broad explanations within specific historical contexts is revealing. A range of alternative methods, perspectives, primary sources from North America, and case studies (especially in environmental history) help develop a critical understanding of the complexities of the fates of societies. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287G. Genes, Genomes and Society. 3 Units.
2013 marks the 60th anniversary of the discovery of the double helix of DNA and the 10th anniversary of the sequencing of the first human genome. Advances in genetics (the study of individual genes), and genomics (the study of an entire genome) have fundamentally altered our understanding of biology. In this seminar, we will focus on topics covered by the mainstream press. We will explore the science behind the news and discuss the philosophical, ethical and societal concerns raised by these scientific advances. Topics will include: the dangers and benefits of genetically modified crops; genetics and the conservation of endangered species; learning about human biology and disease from yeast, flies, worms and fish; the use and potential misuse of genetic fingerprinting by government agencies; genetic testing; personalized medicine; and issues of genetic privacy. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287H. Plants in Medicine. 3 Units.
Plants have always been the basis of medicinal treatments, and as they continue to be essential to modern forms of medicine, alternative and traditional alike. In this course, we will consider the history of how humans have used particular plants for medicinal purposes, such as the cinchona tree (Cinchona officinalis) for quinine, willow bark (Salix) for aspirin, and the yew tree (Taxus baccata) for the cancer medication paclitaxel. By investigating how a plant is used medicinally through time, we will also come to understand the culture that used it and how they conceived of health in relationship to nature. We will read texts that show how a plant’s medicinal uses can be tied to colonialism and global exploration. For example, the first botanical gardens were collections of medicinal plants cultivated for use and experimentation, often containing non-native plant-based cures discovered through colonial contact. While this is not a course in botany per se, we will be discussing basic plant biology, cultivation practices, and the contemporary science of using plants as the basis for pharmaceutical cures. Students should be active course participants in class discussion and on field trips. Writing instruction will focus on research-based argument, and students will complete a researched essay focusing on a medicinal plant of their choice. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287J. Transportation in American Life. 3 Units.
We will explore the critical role of transportation in the development of our cities, regions, states, and nation. The course will consider the historic role of transportation, its current role, and what role it might play in the future. Transportation will be viewed in the context of national policies, overall political will, and our culture at large. Since colonial times, transportation, in its many forms, has been the subject of intense debate, governmental policies, as well as the subject of public and private investment. We will see how certain individuals and groups used ego, power, and wealth to use transportation for shaping the nation’s commerce, travel patterns, and physical appearance. We’ll also see the evolution of transportation decisions and funding. Finally, because of transportation’s daily impact, we will look at current issues as part of every class. We will especially focus on the transportation issues of northeast Ohio, a microcosm of national transportation issues. Some of these issues include funding, decision-making, land use, “suburban sprawl,” and economic development. We’ll also look at transportation issues specific to the University Circle area such as the Health Line and the proposed “Opportunity Corridor.” Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 287K. Human Research Ethics: Scientific Truth vs. Cultural Belief. 3 Units.
Scientific breakthroughs in genetics, neuroscience, and behavioral psychology have allowed us to learn more about ourselves than ever before. But how much do we really want to know - and who gets to decide? Is DNA our destiny? Should the quest for scientific knowledge trump cultural belief? How does society balance risk to a few in the face of the needs of the many? Using a blend of historical documents and literary examples, we will examine the evolution of the ethical standards that govern how doctors experiment on their patients. We will also debate the hard choices that medical researchers make when the quest for scientific truth intersects with cultural belief. Finally, we will apply what we have learned to find solutions to real-world ethical problems in medical research. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287P. Women and Science: Changing Paradigms. 3 Units.
Is science objectively neutral in that true scientific knowledge would be independent of the discoverer? In this view, the scientific discoverer is more like a midwife that brings forth pre-existing knowledge to the world. Or - is scientific knowledge guided and shaped by the people who practice science, in which case it is influenced by the social context in which it occurs, making the scientist more like a sculptor who creates something new using the tools that are currently available. In this course we will examine this second question by looking specifically at the relationship of gender to science through several lenses. One approach we will use is make case studies of the lives of major women scientists and the way that their gender impacted their work, from the type of scientific research they pursued, the kind of support and encouragement that they obtained as they proceeded in their careers, to the rewards and recognition (or the lack of them) that their work received from their peers. Using a more conjectural line of inquiry, we will also consider the role that gender might have played in developing scientific theories and whether there can be such categories as "masculinist" and "feminist" science. We will conclude this part of our inquiry with an analysis of the current state of science and how well these approaches reflect the way science is pursued today. A third issue involves looking at the relationship of gender and science but from the opposite direction. In other words, we will consider how science has influenced our understanding of gender, rather than how gender has influenced science. Over time, scientific ideas about the physiological and intellectual differences between males and females have changed dramatically several times with major political and sociological ramifications. Consequently, we will examine the science of gender in its cultural and political context from antiquity through the twentieth century. In order to explore these interweaving threads, we will be taking an interdisciplinary approach that will draw on the history and philosophy of science (particularly Thomas Kuhn's The Revolution of Scientific Ideas), as well as on anthropology and cultural theory. By the conclusion of the course we will have examined the scientific evidence that has supported assumptions about gender in various philosophical paradigms, including humanism, rationalism (i.e., Enlightenment philosophy), nineteenth century moralism, modernism, and postmodernism. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287Q. Gothic Science: Discovery and Dread in the 18th Century. 3 Units.
Discovery has always enticed us. From the ocean voyage to the space mission, from the discovery of electricity to gene-splicing, men and women have sought to explore the boundaries of knowledge. However, such explorations often come at a cost. New scientific discovery in the 18th century—from neurology to reproduction to electricity—caused as much fear as excitement. The Enlightenment focus on clarity and rationality harbors a dark double self that appears as monstrosity in early Gothic fiction. This course will explore the ways cultural anxieties are re-interpreted through fictional narratives and reflect on what this says about our own scientific explorations today. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287S. Society and Natural Resources. 3 Units.
The relationship between humans and the natural world can be defined in large part by how societies manage natural resources. In this seminar, students will analyze how society-environment interactions have undergone substantial shifts over time...from John Locke's Labor Theory of Value and the rise of utilitarian conservation to more recent approaches based on ecosystem management that emphasize ecological integrity and stakeholder collaboration. Course readings will challenge students to think critically about how humans conceptualize and impact the environment. Class time will be spent discussing the evolution of effective human-ecological systems interactions as outlined in the readings, as well as reviewing student reflection papers that connect course concepts to real word scenarios. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287T. Conflicts and Controversies in American Science and Technology. 3 Units.
How do changes in science and technology affect American life? How do cultural ideas shape scientific practice? Is technological progress inevitable, or do we get to decide what changes we want and which ones we don't? How do we make ethical choices about science and technology in a world with inherent power imbalances? This course provides an introduction to thinking through these questions by presenting works by historians, anthropologists, political scientists, philosophers, journalists, and others to explore a range of social issues in modern science and technology. After two weeks of introduction, the course is divided into four sections: (a) Biology, Biotech, and Biomedicine; (b) Science Policy and the Politics of Science; (c) Problems in Social Science; and (d) Computers and Other Thinking Machines. While the course's content is arranged around these topics, its main purposes are to develop critical thinking skills around ubiquitous and contentious subjects of science, technology, power, culture, and values as well as to hone skills in reading, speaking, research, and essay writing. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 287U. Energy - The Great Challenge Ahead. 3 Units.
Among the greatest challenges we face today is to find means of meeting our energy requirements without jeopardizing the environment or fostering geopolitical conflicts. This course investigates what we can do individually and collectively to tackle this energy challenge. The questions we will consider include: To what extent is the world aware of the energy challenge and its environmental implications? What is already being done to meet this challenge? What role can technology play in addressing it? What research can we be doing now to help predict the future of our energy needs and potential environmental impacts? By investigating these questions, students will develop a fuller and more precise understanding of the energy challenge, as well as generate possible solutions. Students may not receive credit for both USNA 287U and USNA 288L. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 287Y. Large Scale Energy Storage. 3 Units.
In our wired society, energy storage for the distribution of electric energy is a major “game changer.” Efficient and economic large-scale energy storage will help facilitate the growth of renewable energy in the market, as well as increase the overall efficiency of our current electric energy resources. So what needs to happen before we can begin to enjoy these benefits? This course will examine the broad challenges of large-scale energy storage. In what ways do our current technologies prevent us from storing large amounts of energy efficiently and conveniently? How has the marketplace helped or hindered technological improvement? How might government policy encourage advancements in energy storage technologies? Major topics of the course include the global and US energy outlook; the relationship between energy storage, delivery, and use; the role of energy storage for renewable energy implementation; characteristics and challenges of different energy storage technologies; the potential political, public policy, economic, and environmental impact of large-scale energy storage; and approaches to energy storage in other parts of the world. Although this course is designed for students from all disciplines, all students will be expected to do some quantitative analysis Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288B. The Green Energy Transformation in Germany. 3 Units.
This seminar introduces students to the development and successes of green technologies in Germany. We will examine the proactive development of renewable energy and energy conservation technologies, commonly referred to as Energiewende, that was started by the German Green movement and promoted by Germany’s innovative renewable energy policies. We will consider such questions as: What are the implications of this German success story, both for the US and the rest of the world? What lessons can be applied to other situations? What factors might limit the utility of those lessons? In the process of our investigation, we will examine such important issues as globalization, resource finiteness, and sustainability challenges, including economic crises, climate change, energy insecurity, and global competition.
Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288C. Physics for Future Innovators & World Leaders. 3 Units.
We live in an increasingly technological society. Advances in technology improve our lives in countless ways, but they sometimes produce problems and challenges that are so complex that the average business or political leader may not understand them—and therefore cannot make effective decisions to address them. Whether the problem is what to do about climate change, deciding on which sources of energy are worthy of investment, updating the electrical grid, or how to deal with terrorist threats, we will be able to find the best solutions only if our leaders have an adequate understanding of the underlying physical principles (e.g., energy, force, space, radiation, electricity, and exponential growth), and where to find credible information that will assist in answering key questions. This course is designed to equip students with that knowledge. We will also explore various “conversation” that pertain to the above issues with the goal of gaining a better understanding of differing points of view (eg, reporter, scientist, business person, politician, parent, student, people from different cultures), and how rudimentary understanding of the science behind some of our most pressing technological problems can affect a person’s stance or actions. This seminar is appropriate for undergraduates of any major.
Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288G. Sense and Sensibility: Sensing, Information, and Control. 3 Units.
The control of systems has been crucial to technology development since antiquity and has been the key to ushering in some of the biggest transformations of the world including the industrial revolution, the age of aviation, and the modern computer era. Control systems permeate our world and many of the technologies we take for granted and modern life as we know it would not be possible without them. This seminar examines the questions of “What is the role of feedback control in both creating technology and understanding the natural world?” and “How have these roles evolved and interacted with one another?” To this end, beginning with control in antiquity and early industrial control systems and continuing into the present, the design and implementation of feedback to regulate system behavior and control programs to direct processes will be explored. Early industrial control systems corresponding to feedback control systems and control programs, respectively, and their continued evolution will be traced and the impact of their integration in the modern era will be used to expose the roles of observation, information, and computation in achieving control objectives. Finally, this seminar will address the future of control systems including the incorporation of new design paradigms such as biomimetic and biologically-inspired control systems, their application to large scale systems and networks, and the new understanding of biological systems engendered by these new developments and applications.
Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 288I. Beyond Silicon Valley: Growing Entrepreneurship in Transitioning Economies. 3 Units.
The path for entrepreneurs to grow their companies outside of well-developed entrepreneurial ecosystems like Silicon Valley is challenging. Most markets around the world do not look like Silicon Valley and they never will. But there are other models to support new businesses. In transitioning markets (where entrepreneurs do not have much access to private sector financing), government officials, donors, and business leaders are experimenting with creative approaches to support the growth of entrepreneurs. Cleveland is one such place exploring innovative approaches to support new businesses. For over ten years, there has been a massive intervention of government and donor resources to cultivate this entrepreneurial ecosystem. Has this intervention worked in Cleveland? How should success be measured? How does Cleveland’s approach differ from approaches elsewhere around the world? In an unusual twist for a SAGES seminar, the regular classroom discussions will be complemented by your enrollment in a massive open online course (MOOC) that I developed for CWRU. The MOOC is called “Beyond Silicon Valley: Growing Entrepreneurship in Transitioning Economies” and examines the Cleveland case study in depth. The course has attracted over 44,000 students from 190 countries since its launch in April 2014. So, not only will you explore how communities around the world support entrepreneurship, you will also learn about the rapidly developing field of online learning and MOOCs. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288J. Sustainable Energy: Resources, Technologies and Impact. 3 Units.
We hear about sustainable energy but what does that mean? What energy sources are considered sustainable and why? What fraction of our energy needs is likely to come from sustainable energy in the future? Are these estimates reasonable and what are the technological and societal challenges to broader use of sustainable energy? This seminar will explore these and other questions as we learn about energy resources, technologies and solutions that affect our lives and our planet today and in the future. We will evaluate (from a scientific, mathematical and societal perspective) the trade-offs and uncertainties of various energy systems and explore a framework for assessing possible solutions. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288K. Burn, Baby, Burn!. 3 Units.
In the title of his novel Fahrenheit 451, Ray Bradbury was referring to the autoignition temperature for paper. But why does cellulose burn at 451 degrees and not some other temperature? Why do other materials ignite at other temperatures? What exactly happens when materials burn? How can we apply an understanding of the chemistry of combustion to various engineering and social challenges? For example, how does one test flammability? How can we use this knowledge to reduce fire accidents, for example by producing less flammable materials? To inform our investigation, we will read about the history of fire and society, experiment with the basics of materials combustion and testing, and observe how this knowledge is applied at a flammability testing facility. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288L. Future Energy: @home&abroad. 3 Units.
Among the greatest societal challenges we face today is to find means of meeting our energy requirements without jeopardizing the environment or fostering geopolitical conflicts. This course investigates what we can do both individually and collectively to tackle this challenge. The questions we will consider include: To what extent is the world aware of the energy challenge and its environmental implications? What is already being done to meet this challenge? What role can technology play in addressing it? What research can we be doing now to help predict the future of our energy needs and potential environmental impacts? By investigating these questions, students will develop a fuller and more precise understanding of the energy challenge, as well as generate possible solutions. As an important and indeed unique aspect of this course that will greatly enhance their learning experience, students will compare strategies implemented in the State of Ohio and an international location to meet the energy and the environment challenge. To this end the course will require enrolled students to join the instructor in an international location for five or more days over a University break to visit energy conversion and storage installations involving solar thermal, solar photovoltaic, wind farms, geothermal and hydroelectric and acquire profound knowledge of technological and economic factors involved in their operation and maintenance. Students may not receive credit for both USNA 287U and USNA 288L. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288M. Spirits and Synapses. 3 Units.
This seminar is designed to explore the exciting new advances in understanding sleep and how nighttime sleep impacts daily activities. The seminar will begin with a brief and general overview of the human brain during sleep and how brain activity varies during sleep. We will then consider various questions related to sleep. Why do we do sleep? What makes sleep so mysterious and interesting to think about? What are dreams? Why do we sleepwalk? How does a basic understanding of neurophysiology help us understand sleep and its importance for health? How does technology influence our sleep? Our discussions will also extend to the ethical and social implications associated with sleep disorders including self-imposed sleep loss and corresponding personal and legal liabilities. Readings and assignments will include overviews of comparative sleep durations between species including humans, and current sleep testing technologies and their application to modern medicine. In addition to reading, discussing, and writing about sleep, this course will use role-playing as an experiential means of understanding the ethical dilemmas associated with sleep loss. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288N. Engineering Water. 3 Units.
The systems that deliver fresh, clean water and take away dirty water are marvels of engineering. The advancement of societies and improvement in the human condition is intricately linked to our ability to engineer water. Will there be enough drinkable water to satisfy future needs? What is the state of water treatment and delivery, and is it secure? What are the political and social implications of water scarcity? This course will explore the history of water supply, developments in infrastructure, and emerging technologies to meet water needs. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.
USNA 288R. Data Acquisition and the Internet of Things. 3 Units.
The Internet of Things (IoT) is the network of physical objects or "things" embedded with electronics, software, sensors, and network connectivity, which enable these objects to collect and exchange data. Example objects include garage door minders that send texts when we have forgotten to close them or cars that report driving habits to insurance companies. This class proposes to explore the question "What is involved in creating an 'Internet of Things' device and what might the future of the IoT look like?" Virtually everyone benefits from the Internet of Things, but for most individuals the IoT is little understood. The goal here is to demystify the IoT by engaging students in a guided hands-on IoT project that begins with data acquisition and concludes in a working device. Through the project, readings, and discussion, students will be challenged to consider a future world that is even more connected than today and to consider the practical, societal and ethical issues that the IoT creates. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.

USNA 288S. Sand to Smartphone: Silicon and its Applications. 3 Units.
Silicon is the second most abundant element found on our planet. Over the last century, science has allowed us to figure out how to take something as common as beach sand and to use it to create the sophisticated products on which our modern society depends. In this seminar we will explore the use of silicon in everything from transistors to complex microprocessors to smartphones to solar cells and sensors. We will seek to understand the following sorts of questions: What properties make this element so useful? What are the processes by which we take this material and turn it into the technologically sophisticated devices? How did people figure out that silicon could be used to make these advanced devices? Did they anticipate all these uses? Are there other materials that might in the future replace silicon for these purposes? What are the benefits and drawbacks of silicon relative to other materials? To help students more fully understand how silicon devices work, they will work in groups to design a simple device. Requirements to enroll: 1) Passing letter grade in a First Seminar OR concurrent enrollment in FSTS 100 (if transfer student); AND 2) No previous/concurrent enrollment in FSNA/USNA; OR Requisites not met permission.