

## Stanford University Inventory of Sustainability Courses, 2016-17

### AC-1: Academic Courses

Note: All courses below the 200-level are considered undergraduate courses, while all courses at the 200-level or above are considered graduate courses

Subject & Catalog Number	Title	Sustainability Related	Sustainability Focused	Course Description
AA 100	Introduction to Aeronautics and Astronautics	X		The principles of fluid flow, flight, and propulsion; the creation of lift and drag, aerodynamic performance including takeoff, climb, range, and landing performance, structural concepts, propulsion systems, trajectories, and orbits. The history of aeronautics and astronautics.
AA 116Q	Electric Automobiles and Aircraft		X	Transportation accounts for nearly one-third of American energy use and greenhouse gas emissions and three-quarters of American oil consumption. It has crucial impacts on climate change, air pollution, resource depletion, and national security. Students wishing to address these issues reconsider how we move, finding sustainable transportation solutions. An introduction to the issue, covering the past and present of transportation and its impacts; examining alternative fuel proposals; and digging deeper into the most promising option: battery electric vehicles. Energy requirements of air, ground, and maritime transportation; design of electric motors, power control systems, drive trains, and batteries; and technologies for generating renewable energy. Two opportunities for hands-on experiences with electric cars. Prerequisites: Introduction to calculus and Physics AP or elementary mechanics.
AA 122N	Dawn of the Drones: How Will Unmanned Aerial Systems Change Our World?	X		Unmanned aerial systems (UASs) have exploded on the scene in recent years, igniting a national debate about how to use them, how to regulate them, and how to make them safe. This seminar will dive into the many engineering challenges behind the headlines: in the future, how will we engineer UASs ranging in size from simple RC toys to highly-sophisticated autonomous scientific and military data gathering systems? This seminar will examine the key elements required to conceive, implement, deploy, and operate state-of-the-art of drone systems: What variety of problems can they help us solve? How autonomous are they and how autonomous do they need to be? What are the key technical bottlenecks preventing widespread deployment? How are they different from commercial aircraft? What kinds of companies will serve the market for UAV-related products and services? What business models will be successful and why? We will emphasize aspects of design, autonomy, reliability, navigation, sensing, and perception, as well as coordination/collaboration through a series of case studies drawn from our recent experience. Examples include imaging efforts to map the changing coral reefs in the South Pacific, using and controlling swarms of unmanned systems to perform search and rescue missions over large areas, and package delivery systems over large metropolitan areas. Hands-on experience with Stanford-developed UASs will be part of the seminar.
AA 236A	Spacecraft Design	X		The design of unmanned spacecraft and spacecraft subsystems emphasizing identification of design drivers and current design methods. Topics: spacecraft configuration design, mechanical design, structure and thermal subsystem design, attitude control, electric power, command and telemetry, and design integration and operations.
AA 236B	Spacecraft Design Laboratory	X		Continuation of 236A. Emphasis is on practical application of systems engineering to the life cycle program of spacecraft design, testing, launching, and operations.
AA 240A	Analysis of Structures	X		Elements of two-dimensional elasticity theory. Boundary value problems; energy methods; analyses of solid and thin walled section beams, trusses, frames, rings, monocoque and semimonocoque structures.
AA 241A	Introduction to Aircraft Design, Synthesis, and Analysis	X		New aircraft systems emphasizing commercial aircraft. Economic and technological factors that create new aircraft markets. Determining market demands and system mission performance requirements; optimizing configuration to comply with requirements; the interaction of disciplines including aerodynamics, structures, propulsion, guidance, payload, ground support, and parametric studies. Applied aerodynamic and design concepts for use in configuration analysis. Application to a student-selected aeronautical system; applied structural fundamentals emphasizing fatigue and fail-safe considerations; design load determination; weight estimation; propulsion system performance; engine types; environmental problems; performance estimation. Direct/indirect operating costs prediction and interpretation. Aircraft functional systems; avionics; aircraft reliability and maintainability.
AA 241B	Introduction to Aircraft Design, Synthesis, and Analysis	X		New aircraft systems emphasizing commercial aircraft. Economic and technological factors that create new aircraft markets. Determining market demands and system mission performance requirements; optimizing configuration to comply with requirements; the interaction of disciplines including aerodynamics, structures, propulsion, guidance, payload, ground support, and parametric studies. Applied aerodynamic and design concepts for use in configuration analysis. Application to a student-selected aeronautical system; applied structural fundamentals emphasizing fatigue and fail-safe considerations; design load determination; weight estimation; propulsion system performance; engine types; environmental problems; performance estimation. Direct/indirect operating costs prediction and interpretation. Aircraft functional systems; avionics; aircraft reliability and maintainability.
AA 241X	Autonomous Aircraft: Design/Build/Fly	X		Students grouped according to their expertise to carry out the multidisciplinary design of a solar-powered autonomous aircraft that must meet a clearly stated set of design requirements. Design and construction of the airframe, integration with existing guidance, navigation, and control systems, and development and operation of the resulting design. Design reviews and reports.

AA 252	Techniques of Failure Analysis	X		Introduction to the field of failure analysis, including fire and explosion analysis, large scale catastrophe projects, traffic accident reconstruction, aircraft accident investigation, human factors, biomechanics and accidents, design defect cases, materials failures and metallurgical procedures, and structural failures. Product liability, failure modes and effects analysis, failure prevention, engineering ethics, and the engineer as expert witness.
AA 256	Mechanics of Composites	X		Fiber reinforced composites. Stress, strain, and strength of composite laminates and honeycomb structures. Failure modes and failure criteria. Environmental effects. Manufacturing processes. Design of composite structures. Individual design project required of each student, resulting in a usable computer software.
AA 257	Design of Multifunctional Composite Structures	X		Hands-on design, analysis, and manufacturing in composites. Composite beams, columns, and plates; application of finite element methods to composite structures; failure analysis and damage tolerance design of composite structures; and impact damage, compression after impact, and bolted and bonded composites joints. Class divided into working teams (design, analysis, manufacturing, and tests) to design and build a composite structure to be tested to failure; the structure may enter the national SAMPE composite bridge design contest. Prerequisite: 256 or consent of instructor.
AA 279C	Spacecraft Attitude Determination and Control	X		Attitude representation and parametrization; unperturbed and perturbed attitude dynamics and stability; attitude sensors and actuators; linear and nonlinear attitude control; optimal attitude maneuvers; dynamics of flexible spacecraft and space tethers; invited lectures from industry. Prerequisites: AA 242A, ENGR 105, AA 279A, and familiarity with Matlab.
AA 280	Smart Structures		X	Mechanics of smart materials and current approaches for engineering smart structures to monitor health, self heal, and adapt to environment. Definition of smart structures; constitutive models for smart materials; piezoelectric ceramics; electro-active polymers; shape memory alloys; bio-inspired materials and structures; self-healing materials; sensors and sensor networks; structural health monitoring; and energy harvesting.
AFRICAAM 100	Grassroots Community Organizing: Building Power for Collective Liberation (Same as CSRE 100, FEMGEN 100X, URBANST 108)	X		This course explores the theory, practice and history of grassroots community organizing as a method for developing community power to promoting social justice. We will develop skills for 1-on-1 relational meetings, media messaging, fundraising strategies, power structure analysis, and strategies organizing across racial/ethnic difference. And we will contextualize these through the theories and practices developed in the racial, gender, queer, environmental, immigrant, housing and economic justice movements to better understand how organizing has been used to engage communities in the process of social change. Through this class, students will gain the hard skills and analytical tools needed to successfully organize campaigns and movements that work to address complex systems of power, privilege, and oppression. As a Community-Engaged Learning course, students will work directly with community organizations on campaigns to address community needs, deepen their knowledge of theory and history through hands-on practice, and develop a critical analysis of inequality at the structural and interpersonal levels. Placements with community organizations are limited. Enrollment will be determined on the first day through a simple application process. Students will have the option to continue the course for a second quarter in the Winter, where they will execute a campaign either on campus or in collaboration with their community partner.
AFRICAAM 102B	CapaCity Design Studio	X		Silicon Valley's rapid expansion has created explosive urban development in a fragile and under-prepared natural context. Delicate coastal ecology and rapid urbanization (expanding technology headquarters, new residential housing, parking, services, etc.) are competing for space. The same land also serves the regional functions of transport, open space, recreation, water supply, flood protection and wastewater treatment. Compounding the problems between these competing factors are global climate change instabilities increasing the certainty of catastrophic flooding, infrastructure collapse, and other urban resilience challenges. Students will be immersed in a process that allows them to understand and spatially identify these risks, develop a vocabulary and understanding of innovative tools to respond to them, and then work with expert practitioners to create unique design responses. Students will be provided with urban design frameworks (for planning, site development, and conservation) combined with advanced sustainable design concepts (such as resource co-optimization, and adaptable infrastructure platforms, and high performance urban ecology) by working with expert lecturers and in small groups. Students will ultimately develop a series of visual and technical presentations to propose a final thesis for a local intervention that could be replicated in other coastal contexts globally. This course has been designed to develop student learning through a project-based format. Students will be organized into design teams of 3 or 4 and will have the semester to collaborate with partners on an interdisciplinary proposal including policy and design recommendations.
AFRICAAM 132	Social Class, Race, Ethnicity, and Health (Same as HUMBIO 122S)	X		Examines health disparities in the U.S., looking at the patterns of those disparities and their root causes. Explores the intersection of lower social class and ethnic minority status in affecting health status and access to health care. Compares social and biological conceptualizations of race and ethnicity.

AFRICAAM 157P	Solidarity and Racial Justice (Same as CSRE 157P, AMSTUD 157P, FEMGEN 157P)	X		(Co-taught by Dereca Blackmon and Daniel Murray) Is multiracial solidarity necessary to overcome oppression that disproportionately affects people of color? What is frontline leadership and what role should people play if they are not part of frontline communities? In this course we will critically examine practices of solidarity and allyship in movements for collective liberation. Through analysis of historical and contemporary movements, as well as participation in movement work, we will see how movements have built multiracial solidarity to address issues that are important to the liberation of all. We will also see how racial justice intersects with other identities and issues. This course is for students that want to learn how to practice solidarity, whether to be better allies or to work more effectively with allies. As a community engaged learning course, students will have the option to work with an organization that is explicitly devoted to this kind of multiracial movement-building work around a particular issue. Specific issues are yet to be determined, but may include environmental justice, policing and mass incarceration, and education.
AFRICAAM 116	Education, Race, and Inequality in African American History, 1880-1990 (Same as HISTORY 255E, CSRE 216X, EDUC 216, AMSTUD 216)	X		Seminar. The relationship among race, power, inequality, and education from the 1880s to the 1990s. How schools have constructed race, the politics of school desegregation, and ties between education and the late 20th-century urban crisis.
AFRICAST 31	Media and Conflict in Africa (Same as AFRICAST 131)	X		Introduction to the variety of roles played by local and international media in covering conflict situations across the continent in the late 20th- and early 21st-centuries. The objective is to develop a theoretical and empirical understanding of the media as active participants in conflicts, rather than neutral witnesses. How the media in the African context have become tools for propaganda and for encouraging violence, as well as their role in promoting dialogue, peace and reconciliation between communities. These questions are relevant to the context of contemporary Africa where conflicts fueled by ethnic hatred or democratic aspirations have unfolded along with the development of media and communication technologies. Key concepts such as objectivity, impartiality, hate speech, peace journalism, citizen journalism, and cosmopolitanism, to analyze the role played by the media in case studies in Burundi, Cameroon, Egypt, Ethiopia, Kenya, Nigeria, Rwanda and Uganda. A wide variety of material including: readings drawn from a fields such as media and journalism studies, political sciences, anthropology, and postcolonial theory; linguistic, visual, audio, video and multimedia material produced by news media; and films and documentaries.
AFRICAST 81	Media Representations of Africa (Same as AFRICAST 181, AFRICAAM 81)	X		How has Africa been dominantly represented in the media? How are these representations challenged, complexified and reproduced in the postcolonial context? What is the role of African media in these processes? This class is an introduction to the variety of roles played by the media in representing Africa, with a particular focus on the postcolonial context. The topic is particularly relevant to contemporary Africa as the emerging middle-class, economic and cultural globalization, and the uptake for communication technologies are shaping contested images of the continent. You will: develop a theoretical and empirical understanding of the media as instruments of domination but also of resistance; learn how to critically deconstruct media representations in everyday life; understand the challenges of intercultural communication in an unequal world. Key concepts such as: representation, stereotyping, cultural appropriation, afropessimism, afrocentrism, afro optimism, afropolitanism. Readings drawn from media and cultural studies, anthropology, postcolonial theory and literature. In class-analysis of photographs, news articles and broadcasts, PR campaigns, social media, films and documentaries.
AFRICAST 209	Running While Others Walk: African Perspectives on Development (Same as AFRICAST 109)	X		Throughout the history of modern Africa, Africans have specified their desired future development, understood broadly and identified the major obstacles in achieving it. Debates about development have intensified in the post-colonial period, especially as African countries have replaced the leaders installed at independence. Amidst the general critique of the imposition of external values and rules, Africans have differed, sometimes sharply, on priorities, process, and programs. While for some the challenge is to catch up with development elsewhere, for others it is essential to leap ahead, to set the pace, to initiate a radical social, economic, and political transformation. To ground and extend the common approaches to studying development that emphasize economics and that rely largely on external commentators, we will explore African perspectives. Our major task will be a broad overview, sampling the analyses of Africa's intellectuals in several domains. Course participants will review, compare, and analyze major contributions, developing an understanding of contemporary intellectual currents.
AFRICAST 212	AIDS, Literacy, and Land: Foreign Aid and Development in Africa (Same as AFRICAST 112, AFRICAAM 111)	X		Is foreign aid a solution? or a problem? Should there be more aid, less aid, or none at all? How do foreign aid and local initiatives intersect? A clinic in Uganda that addresses AIDS as a family and community problem. Multiple strategies in Tanzania to increase girls' schooling. These are imaginative and innovative approaches to pressing and contested policy challenges. We will examine several contentious issues in contemporary Africa, exploring their roots and the intense conflicts they engender, with special attention to foreign aid and the aid relationship. As African communities and countries work to shape their future, what are the foreign roles and what are their consequences?

AMSTUD 94	Topics in Food Studies	X		This course examines food in the United States over the last hundred years as it relates to the broad themes of nature, disease, technology, and labor. Though firmly grounded in American Studies, an interdisciplinary perspective draws from the material and methods of anthropology, cultural studies, art history, and history. Specific topics include diet-related disease, tipping and the subminimum wage, the concept of agrarian democracy, supermarkets, and food preservation. Creative assignments include writing a menu, conducting a food observation, and reviewing a restaurant. Students will actively engage with paintings, sculpture, film, advertisements, restaurant reviews, commercials, and <del>music videos</del> .
AMSTUD 95	Consumer Culture	X		This course will examine consumerism in the United States, first focusing on the rise of advertising, mass market goods, catalogues, and department stores at the turn of the 20th century. We will then examine post-WWII suburbia and the rise of the "good life" and the ensuing backlash in 1960s counterculture anti-consumerist movements. Our topics will include the annual no-shopping day, back to nature movements, urban homesteading, thrift, slow food activism, and the efforts to resist mass production in food, clothing, and housing. Sources include novels, films, magazines, music, and advertisements.
AMSTUD 150X	From Gold Rush to Google Bus: History of San Francisco (Same as URBANST 150, HISTORY 152E)	X		This class will examine the history of San Francisco from Native American and colonial settlement through the present. Focus is on social, environmental, and political history, with the theme of power in the city. Topics include Native Americans, the Gold Rush, immigration and nativism, railroads and robber barons, earthquake and fire, progressive reform and unionism, gender, race and civil rights, sexuality and politics, counterculture, redevelopment and gentrification. Students write final project in collaboration with ShapingSF, a participatory community history project documenting and archiving overlooked stories and memories of San Francisco.
ANES 70Q	Critical Illness: Patients, Physicians, and Society	X		Examines the various factors involved in shaping the critical care illness experience for three groups of people: the clinicians, the patients, and patients' families. Medical issues, economic forces and cost concerns, cultural biases, and communication errors can all influence one's perception. Helps students understand the arc of critical illness, and how various factors contribute to the interactions between those various groups. Includes an immersion experience (students are expected to round with clinicians in the ICU and to attend Schwartz rounds, a debriefing meeting about difficult emotional situation) and a mentoring experience (with critical care fellows), in addition to routine class work.
ANTHRO 1	Introduction to Cultural and Social Anthropology (Same as ANTHRO 201)	X		This course introduces basic anthropological concepts and presents the discipline's distinctive perspective on society and culture. The power of this perspective is illustrated by exploring vividly-written ethnographic cases that show how anthropological approaches illuminate contemporary social and political issues in a range of different cultural sites.
ANTHRO 34	Animals and Us (Same as ARCHLGY 34)	X		The human-animal relationship is dynamic, all encompassing and durable. Without exception, all socio-cultural groups have evidenced complex interactions with the animals around them, both domesticated and wild. However, the individual circumstances of these interactions are hugely complicated, and involve much more than direct human-animal contact, going far beyond this to incorporate social, ecological and spiritual contexts. This course delves into this complexity, covering the gamut of social roles played by animals, as well as the methods and approaches to studying these, both traditional and scientific. While the notion of 'animals as social actors' is well acknowledged, their use as proxies for human autecology (the relationship between a species and its environment) is also increasingly recognized as a viable mechanism for understanding our cultural and economic past. It will piece together the breadth of human-animal relationships using a wide geographic range of case studies.
ANTHRO 39	Sense of Place	X		This course examines the life or places as shaped by environmental events and projects aimed towards rural or urban development. Drawing methodological insights from anthropology, cultural geography and environmental studies, we examine the forces that generate place problems for humans and nonhumans. Each encounter with place and displacement sets up a particular issue for us to grapple with: How would we address issues created by natural disasters, the seizure of land through legal means that fall under eminent domain or gentrification projects? Through a critical dialogue with interdisciplinary fields that inform the readings, the seminar aims to bring theoretical and methodological insights to inform our practical suggestions for how to address placeness and displaceness at different scales.
ANTHRO 42	Megacities	X		In this course we will examine the meaning, processes, and challenges of urbanization. Through a series of targeted readings across history and geography and through the study of varied means of representation (anthropology, literature, cartography, film, etc), the class will analyze the ways in which urban forms have come into being and created, met, and/or ignored challenges such as disease, water, transport, religious and class conflict, colonialism, labor, and trade. Students will read anthropology in conjunction with other disciplines (literature, urban planning, public health, architecture, and economics) to learn the ways in which ethnographies of immigration, urban poverty, class disparity, economic development and indicators, noise, and transportation substantively augment our understanding of how people live within globalization.
ANTHRO 82	Medical Anthropology (Same as ANTHRO 282, HUMBIO 176A)	X		Emphasis is on how health, illness, and healing are understood, experienced, and constructed in social, cultural, and historical contexts. Topics: biopower and body politics, gender and reproductive technologies, illness experiences, medical diversity and social suffering, and the interface between medicine and science.
ANTHRO 90C	Theory of Ecological and Environmental Anthropology (Same as HUMBIO 118)	X		Dynamics of culturally inherited human behavior and its relationship to social and physical environments. Topics include a history of ecological approaches in anthropology, subsistence ecology, sharing, risk management, territoriality, warfare, and resource conservation and management. Case studies from Australia, Melanesia, Africa, and S. America.

ANTHRO 110	Environmental Archaeology (Same as ANTHRO 210)	X		This course investigates the field of environmental archaeology. Its goals are twofold: 1) to critically consider the intellectual histories of environmental archaeology, and, 2) to survey the various techniques and methods by which archaeologists assess historical environmental conditions through material proxies. The course will include lab activities.
ANTHRO 118	Heritage, Environment, and Sovereignty in Hawaii (Same as EARTHSYS 118)		X	This course explores the cultural, political economic, and environmental status of contemporary Hawaiians. What sorts of sustainable economic and environmental systems did Hawaiians use in prehistory? How was colonization of the Hawaiian Islands informed and shaped by American economic interests and the nascent imperialism of the early 20th century? How was sovereignty and Native Hawaiian identity been shaped by these forces? How has tourism and the leisure industry affected the natural environment? This course uses archaeological methods, ethnohistorical sources, and historical analysis in an exploration of contemporary Hawaiian social economic and political life.
ANTHRO 130E	GIS, Archaeological Evaluation, Impact Assessment, and Site Management (Same as ANTHRO 230E)	X		The course explores archaeological GIS and the techniques adopted to acquire, evaluate and manage spatial data. The students will be provided both with theoretical and practical principles of GIS for archaeological use and site management. Students will learn a complete GIS workflow, from data acquisition to decision making. They will use Venice, a multilayered site, as a test case. The course will examine practical evaluation processes in consideration of current and future development projects in the Venetian lagoon, listed as a UNESCO World Heritage Site.
ANTHRO 148B	Islam and Human Rights in Theory and Practice (Same as CSRE 148B, FEMGEN 148B)	X		This course aims to explore various aspects of the contemporary debate over the compatibility of Islam with human rights. As a class, we will examine the contours of various human rights debates as they surface in the writings of Islamic thinkers, as well as emerge in Muslim societies today. What is/are Islamic conceptions of human rights? How is this discourse activated, used and challenged by people living in Muslim Societies? How do Islamic conceptions and articulations of human rights relate to western/universal, conceptions? Where do they intersect and diverge from one another?
ANTHRO 168D	Environmental Change and the Politics of Nature		X	This seminar course examines some important environmental changes happening right now around the world, and considers the role of people's diverse forms of politics in these changes. This course covers the core concepts and methods of analysis of interdisciplinary environmental studies. With readings, documentary films and writing students will familiarize themselves with a way of thinking that links ecology and society, bringing in issues of gender, ethnicity, race and class, as well as the production of technology and knowledge itself, to analysis of environmental change.
ANTHRO 177C	Perspectives in International Development	X		In this course, we explore the contested nature of development as a concept, goal, intervention, project, and policy. Because development is often associated with ideas surrounding poverty and well-being it is used as a tool by government agencies, multilateral organizations, and non-governmental organizations to achieve livelihood improvement and biodiversity/natural resource conservation. Development projects have the potential to achieve goals that are socially, ecologically, and economically focused while providing a just distribution of benefits. What does development really mean? What does it include (and not include)? And who? When (under what conditions) does development work? How do we measure? Who decides? Who benefits from development, and who pays the costs? We will try to answer these questions and more like them, each week exploring themes related to development while drawing from various disciplines and contexts. This course is primarily discussion focused. If you prefer just listening, this class may not be the best fit for you!
ANTHRO 178	Evolution and Conservation in Galapagos (Same as ANTHRO 278)		X	The contribution of research in the Galapagos Islands to our current understanding of evolution and conservation. Writings from Darwin to Dawkins, as they reveal patterns and processes of evolution including selection, adaptation, speciation, and coevolution. Current conservation strategies in the archipelago, and urgent measures needed today before unique species and adaptations are lost.
ANTHRO 217A	Stuff (Same as ANTHRO 117A)	X		Never before have humans been engulfed by so much stuff. Stuff is needed to survive giving us the basics of food, clothing, and shelter. But stuff does so much more. Smart phones rule our social interactions. Louis Vuitton handbags display status. Air conditioning masters nature. Picassos inspire beauty. Wedding bands promise eternal love. Crosses connect believers to God. Is stuff really who we are? This seminar explores the science of stuff, past, present and future, investigating deeply-held beliefs about the meaning, value, and purpose of objects. Because our stuff has become such a popular obsession, this course embraces the eclectic intersection of popular and academic knowledge. Students will seek to answer the complex whys of our relationship with objects and understand our future human condition made by the material world.
ANTHRO 223A	Debating Repatriation (Same as ANTHRO 123A)	X		The debates over the return of cultural property have raged for centuries. At stake are key questions about the rights of Indigenous peoples, intellectual freedom, nationalism, globalization, heritage management, the meaning of history, and the purpose of museums in the world. This seminar examines these vital discussions that intersect law and morality, science and religion, culture and politics. Discussions will be informed by cross-cultural, legal, ethical perspectives, exploring both the philosophical and practical implications of the repatriation debates. This course will provide students with a nuanced historical viewpoint of museum collections, heritage policies, and legal dimensions that underpin contests over cultural property.

ANTHRO 266	Political Ecology of Tropical Land Use: Conservation, Natural Resource Extraction, and Agribusiness (Same as ANTHRO 166)		X	Seminar. The state, private sector, development agencies, and NGOs in development and conservation of tropical land use. Focus is on the socioeconomic and political drivers of resource extraction and agricultural production. Case studies used to examine the local-to-global context from many disciplines. Are maps and analyses used for gain, visibility, accountability, or contested terrain? How are power dynamics, land use history, state-private sector collusion, and neoliberal policies valued? What are the local and extra-local responses?
ANTHRO 337	The Politics of Humanitarianism	X		What does it mean to want to help, to organize humanitarian aid, in times of crisis? At first glance, the impulse to help is surely preferable to indifference and inaction. This does not mean that humanitarian interventions entail no ethical or political stakes or that they are beyond engaged critique. We need to critique precisely that which we value, and to ask some hard questions, among them these: What are the differences among humanitarianism, charity, and philanthropy? What of social obligations and solidarities? How does the neoliberal world order currently create structural inequalities that ensure the reproduction of poverty and violence? How does the current order of things resemble or differ from the colonial world order? This course examines the history of humanitarian sensibilities and the emergence of organized action in the cause of humanity. In the early years of humanitarian intervention, political neutrality was a key principle; it has now come under ever greater analytical and political scrutiny. We will examine the reasons for the politicization and militarization of aid -- be it humanitarian aid in natural disasters or political crises; development programs in the impoverished south (the Third World), or peace-keeping. We will end with a critical exploration of the concept of human rights, humanity, and personhood. The overall methodological aim of the course is to demonstrate what insights an ethnographic approach to the politics, ethics, and aesthetics of humanitarianism can offer.
ANTHRO 343	Culture as Commodity	X		Focus is on theories of commodification, interests in tourism, national cultures as marketable objects, and how identities are constituted through production and consumption. The formation of global style and taste. Prerequisite: consent of instructor. Co-term students and above may sign up for this course.
ANTHRO 353	Landscape	X		This seminar offers an interdisciplinary approach to the study of landscape, noting the various processes and projects that have help create them. Readings draw together a broad range of theoretical approaches that are attentive to human-non-human interactions and the overlapping and divergent spatial and temporal questions of the exchanges between landscapes and humans. The readings will also draw attention to representational and non-representational ways that material and symbolic aspects of landscapes help constitute the making of place. The aim of the seminar is to explore the various methodologies for what they offer for the study of place.
ANTHRO 367	The Anthropology of Science: Global Politics and Laboratory Life	X		Science and technology are important cultural products that often dramatically reorganize various aspects of human life. In this course we will explore how recent innovations in the life sciences and biomedicine may reconfigure crucial elements of social institutions, lend new structures to identity politics, and often change the way we interact with and conceive of nature. We will examine these issues in various global settings to explore how everyday politics shape politics of life in different locales.
ANTHRO 445	Anthropology Brown Bag Series	X		Current topics and trends in cultural/social anthropology, archaeology, and environmental and ecological anthropology. Enrollment in this noon-time series is restricted to the Department of Anthropology Master's students and First and Second-year PhD students.
APPPHYS 79Q	Energy Options for the 21st Century		X	Preference to freshmen. Choices for meeting the future energy needs of the U.S. and the world. Basic physics of energy sources, technologies that might be employed, and related public policy issues. Trade-offs and societal impacts of different energy sources. Policy options for making rational choices for a sustainable world energy economy.
APPPHYS 85N	Understanding Biology with Numbers	X		Preference to freshmen. Developing understanding of biological phenomena via quantitative reasoning including framing questions, order of magnitude estimation, and ways of looking at data. Topics span from cellular processes to motion of animals to global carbon cycles.
ARCHLGY 119	Zooarchaeology: An Introduction to Faunal Remains (Same as ANTHRO 119, ANTHRO 219)	X		As regularly noted, whether historic or pre-historic, animal bones are often the most commonly occurring artifacts on archaeological sites. As bioarchaeological samples, they offer the archaeologist an insight into food culture, provisioning, trade and the social aspects of human-animal interactions. The course will be taught through both practical and lecture sessions: the hands-on component is an essential complement to the lectures. The lectures will offer grounding in the main methodological approaches developed, as well as provide case-studies to illustrate where and how the methods have been applied. The practical session will walk students through the skeletal anatomy of a range of species. It will guide students on the identification of different parts of the animal, how to age / sex individuals, as well as recognize taphonomic indicators and what these mean to reconstructing post-depositional modifications.
ARCHLGY 124	Archaeology of Food: production, consumption and ritual (Same as ARCHLGY 224)	X		This course explores many aspects of food in human history from an archaeological perspective. We will discuss how the origins of agriculture helped to transform human society; how food and feasting played a prominent role in the emergence of social hierarchies and the development of civilization; and how various foodways influenced particular cultures. We will also conduct experimental studies to understand how certain methods of food procurement, preparation, and consumption can be recovered archaeologically.

ARCHLGY 126	Archaeobotany (Same as ARCHLGY 226)	X		Archaeobotany, also known as paleoethnobotany, is the study of the interrelationships of plants and humans through the archaeological record. Knowledge and understanding of Archaeobotany sufficient to interpret, evaluate, and understand archaeobotanical data. Dominant approaches in the study of archaeobotanical remains: plant macro-remains, pollen, phytoliths, and starch grains in the identification of diet and environmental reconstruction.
ARTHIST 147	Modernism and Modernity (Same as ARTHIST 347)	X		The development of modern art and visual culture in Europe and the US, beginning with Paris in the 1860s, the period of Haussmann, Baudelaire and Manet, and ending with the Bauhaus and Surrealism in the 1920s and 30s. Modernism in art, architecture and design (e.g., Gauguin, Picasso, Duchamp, Mondrian, Le Corbusier, Breuer, Dali) will be explored as a compelling dream of utopian possibilities involving multifaceted and often ambivalent, even contradictory responses to the changes brought about by industrialization, urbanization, and the rise of mass culture.
ARTHIST 152	The American West (Same as POLISCI 124A, ENGLISH 124, HISTORY 151, AMSTUD 124A)	X		The American West is characterized by frontier mythology, vast distances, marked aridity, and unique political and economic characteristics. This course integrates several disciplinary perspectives into a comprehensive examination of Western North America: its history, physical geography, climate, literature, art, film, institutions, politics, demography, economy, and continuing policy challenges. Students examine themes fundamental to understanding the region: time, space, water, peoples, and boom and bust cycles.
ARTSTUDI 164	DESIGN IN PUBLIC SPACES	X		How does our design of public spaces and elements of our built environment influence and control people's movements and expressions in these spaces? Can re-designing a trashcan or a stairway change how people throw away their trash or use the stairs? What are the principles of democracy, surveillance, or personal expression at stake in our current shared spaces? How have artists and designers used their skills to question or re-direct people's behavior in these public spheres, or in other spheres of shared cultural heritage? Strategies include re-designing components of the built environment, but also other strategies of intervention, tactical media and reality hacking.
ARTSTUDI 253	ECOLOGY OF MATERIALS		X	Advanced studio-based sculpture course. Artists concerned with environmental impact and the interconnection of art with other fields. Students will take a critical look at the materials used in sculpture, in relation to environmental concerns, and the impact of material and technique upon form and content; therefore understanding the physical, expressive and environmental possibilities of diverse materials. Conceptual and technical considerations. Group discussions, critiques, readings, video presentations, a field trip to a local artist-in-residence program, and visiting lecturers.
ARTSTUDI 284	Art and Biology	X		The relationship between biology and art. Rather than how art has assisted the biological sciences as in medical illustration, focus is on how biology has influenced art making practice. New technologies and experimental directions, historical shifts in artists' relationship to the living world, the effects of research methods on the development of theory, and changing conceptions of biology and life. Projects address these themes and others that emerge from class discussions and presentations.
ARTSTUDI 360B	Design Masters Project II	X		This two part graduate level seminar and studio course is required for second year JPD MFA students, and open to second year JPD ME students and all MFA art practice students. In this second quarter of the course, students will refine and expand one of their assignments from Sites/Situations I to create a completed site-specific installation, intervention, or product/object, which provokes discussion or change in our community. Works will be realized at various sites around campus, or in the community at large. Issues such as budget, public safety and code will be addressed. Time will be allotted for documentation, critique, and assessment of these projects.
ASNAMST 123	Asian Americans and Environmental Justice (Same as EARTHSYS 123)		X	One central tenet of the environmental justice movement is centering the leadership of frontline communities. Unfortunately, the struggles of Asian Americans on the frontlines of corporate environmental pollution and extraction are less visible and less well-known. In this course, we will explore the Asian American voices that have contributed to the development of the environmental justice movement and the leadership that is shaping the future of this movement. This course is designed to provide students with education about the history of the environmental justice movement, the future being envisioned, and the strategies that are needed to get to the vision. It will draw on lectures, readings, guest presentations, case studies, and the instructor's more than 15 years of experience with organizing and social justice campaigns. Students will learn about the principles guiding the environmental justice movement; the vision and framework of how we achieve a just transition to a regenerative economy; the process of organizing and campaign work to advance a community agenda; and skills in collecting, analyzing, and communicating information.
BIO 2N	Ecology and Evolution of Infectious Disease in a Changing World		X	This seminar will explore the ways in which anthropogenic change, climate change, habitat destruction, land use change, and species invasions effects the ecology and evolution of infectious diseases. Topics will include infectious diseases of humans, wildlife, livestock, and crops, effects of disease on threatened species, disease spillover, emerging diseases, and the role of disease in natural systems. Course will be taught through a combination of popular and scientific readings, discussion, and lecture.
BIO 3	Frontiers in Marine Biology	X		An introduction to contemporary research in marine biology, including ecology, conservation biology, environmental toxicology, behavior, biomechanics, evolution, neurobiology, and molecular biology. Emphasis is on new discoveries and the technologies used to make them. Weekly lectures by faculty from the Hopkins Marine Station.

BIO 3N	Views of a Changing Sea: Literature & Science		X	The state of a changing world ocean, particularly in the eastern Pacific, will be examined through historical and contemporary fiction, non-fiction and scientific publications. Issues will include harvest and mariculture fisheries, land-sea interactions and oceanic climate change in both surface and deep waters.
BIO 5N	Tipping Point for Planet Earth: How Close Are We to the Edge?		X	We will explore why the earth is headed toward a tipping point: a change that is so rapid, so extreme, and so unexpected that humanity may not be able to recover. We will cover synergies between people, stuff, storms, hunger, thirst, toxins, disease and war. Students will read chapters from the instructor's new book, Tipping Point for Planet Earth, and will participate in class discussions. Each student will produce their own projects based on one of the course themes.
BIO 7N	Introduction to Conservation Photography		X	Introduction to the field of conservation photography and the strategic use of visual communication in addressing issues concerning the environment and conservation. Students will be introduced to basic digital photography, digital image processing, and the theory and application of photographic techniques. Case studies of conservation issues will be examined through photographs and multimedia platforms including images, video, and audio. Lectures, tutorials, demonstrations, and optional field trips will culminate in the production of individual and group projects.
BIO 24N	Visions of Paradise: Garden Design	X		Through literature readings and field trips to local gardens learn the principles and esthetics of classic garden designs: Italian Renaissance, botanical teaching, Japanese, English cottage, and others. Design a personal vision of paradise with details of species, visual and scent impact, water features, and hardscape. Open your eyes to a new appreciation of the world of plants and learn some physiology and genetics that explains the specific properties of individual species.
BIO 30	Ecology for Everyone (Same as EARTHYSYS 30)		X	Everything is connected, but how? Ecology is the science of interactions and the changes they generate. This project-based course links individual behavior, population growth, species interactions, and ecosystem function. Introduction to measurement, observation, experimental design and hypothesis testing in field projects, mostly done in groups. The goal is to learn to think analytically about everyday ecological processes involving bacteria, fungi, plants, animals and humans. The course uses basic statistics to analyze data; there are no math prerequisites except arithmetic. Open to everyone, including those who may be headed for more advanced courses in ecology and environmental science.
BIO 46	Introduction to Research in Ecology and Evolutionary Biology	X		The goal of this course is to develop an understanding of how to conduct biological research, using a topic in ecology, Evolutionary Biology, and Plant Biology as a practical example. This includes the complete scientific process: assessing background literature, generating testable hypotheses, learning techniques for field- and lab-based data collection, analyzing data using appropriate statistical methods, and writing and sharing results. To build these skills, this course focuses on the microorganisms associated with lichen epiphytes. Students, working in teams, develop novel research hypotheses and execute the necessary experiments and measurements to test these hypotheses. In addition, students will learn how to manipulate, visualize and analyze data in R. The capstone of the course is an oral defense of students' findings, as well as a research paper in the style of a peer-reviewed journal article. Labs are completed both on campus and at Jasper Ridge.
BIO 47	Introduction to Research in Ecology and Evolutionary Biology	X		The goal of this course is to develop an understanding of how to conduct biological research, using a topic in ecology, Evolutionary Biology, and Plant Biology as a practical example. This includes the complete scientific process: assessing background literature, generating testable hypotheses, learning techniques for field- and lab-based data collection, analyzing data using appropriate statistical methods, and writing and sharing results. To build these skills, this course focuses on the microorganisms associated with lichen epiphytes. Students, working in teams, develop novel research hypotheses and execute the necessary experiments and measurements to test these hypotheses. In addition, students will learn how to manipulate, visualize and analyze data in R. The capstone of the course is an oral defense of students' findings, as well as a research paper in the style of a peer-reviewed journal article. Labs are completed both on campus and at Jasper Ridge.
BIO 52	I, Biologist: Diversity Improves the Science of Biology (Same as CSRE 52H)	X		Disciplinary priorities, research agendas, and innovations are determined by the diversity of participants and problem-solving is more successful with a broad range of approaches. Using case studies in biological research, we propose to use these insights to help our students learn why a diverse scientific community leads to better discovery and improves the relevance of science to society. Our premise is that a diverse set of perspectives will impact not only how we learn science, but how we do science.
BIO 60	Introduction to Problem Solving in Biology	X		Why is Lyme disease spreading? How does HIV become drug resistant? How do other animals affect our disease risk? In BIO 60 students will examine actual case studies to experience how different scientific approaches are used to battle infectious disease. They will evaluate information presented in the popular media and the scientific literature, and will directly participate in the scientific process through hands-on collection, documentation and analyses of authentic scientific data. Students will cultivate their scientific curiosity by discovering the natural world with a Foldscope, the 'origami paper microscope' ( <a href="https://microcosmos.foldscope.com">https://microcosmos.foldscope.com</a> ). Students will build critical thinking skills by creating hypotheses, and designing experiments that pertain to problems in infectious disease. Students will work in teams to expand their thinking and will practice communicating science to different audiences.
BIO 101	Ecology	X		The principles of ecology. Topics: interactions of organisms with their environment, dynamics of populations, species interactions, structure and dynamics of ecological communities, biodiversity. Half-day field trip required.

BIO 117	Biology and Global Change (Same as EARTHSYS 111, ESS 111)	X		The biological causes and consequences of anthropogenic and natural changes in the atmosphere, oceans, and terrestrial and freshwater ecosystems. Topics: glacial cycles and marine circulation, greenhouse gases and climate change, tropical deforestation and species extinctions, and human population growth and resource use. Prerequisite: <u>Biology or Human Biology core or graduate standing.</u>
BIO 145	Ecology and Evolution of Animal Behavior (Same as BIO 245)	X		Ecological and evolutionary perspectives on animal behavior, with an emphasis on social and collective behavior. This is a project-based course in a lecture/seminar format. Seminars will be based on discussion of journal articles. <u>Independent research projects on the behavior of animals on campus.</u>
BIO 182	Modeling Cultural Evolution (Same as BIO 282)	X		Seminar. Quantitative models for the evolution of socially transmitted traits. Rates of change of learned traits in populations and patterns of cultural diversity as a function of innovation and cultural transmission. Learning in constant <u>and changing environments. Possible avenues for gene-culture coevolution.</u>
BIO 234	Conservation Biology: A Latin American Perspective (Same as HUMBIO 112, BIO 144)		X	Principles and application of the science of preserving biological diversity. Conceptually, this course is designed to explore 4 major components relevant to the conservation of biodiversity, as exemplified by the Latin American region. The conceptual frameworks and principles, however, should be generally applicable, and provide insights for all regions of the world, including those of lesser biodiversity. Satisfies Central Menu Area 4 for Bio majors. Prerequisite: BIO 101, or BIO 43 or HUMBIO 2A with consent of instructor. Graduate level students will be expected to conduct a literature research exercise leading to a written paper, addressing a topic of their choosing, derived from any of the themes <u>discussed in class.</u>
BIO 238	Ecosystem Services: Frontiers in the Science of Valuing Nature (Same as BIO 138)		X	This advanced course explores the science of valuing nature, beginning with its historical origins, and then its recent development in natural (especially ecological), economic, psychological, and other social sciences. We will use the ecosystem services framework (characterizing benefits from ecosystems to people) to define the state of knowledge, core methods of analysis, and research frontiers, such as at the interface with biodiversity, resilience, human health, and human development. Intended for diverse students, with a focus on research and real-world cases. To apply, please email the instructor (gdaily@stanford.edu) with a brief description of your background and research interests.
BIO 302	Current Topics and Concepts in Population Biology, Ecology, and Evolution	X		Required of first-year PhD students in population biology, and ecology and evolution. Major conceptual issues and <u>developing topics. This course is nopen only to Biology PhD students and is not open to auditors."</u>
BIO 303	Current Topics and Concepts in Population Biology, Ecology, and Evolution	X		Required of first-year PhD students in population biology, and ecology and evolution. Major conceptual issues and <u>developing topics. This course is nopen only to Biology PhD students and is not open to auditors."</u>
BIO 304	Current Topics and Concepts in Population Biology, Ecology, and Evolution	X		Required of first-year PhD students in population biology, and ecology and evolution. Major conceptual issues and <u>developing topics. This course is nopen only to Biology PhD students and is not open to auditors.</u>
BIO 327	Research Frontiers in Biodiversity and Ecosystem Services	X		The use of satellite remote sensing to monitor land use and land cover, with emphasis on terrestrial changes. Topics include pre-processing data, biophysical properties of vegetation observable by satellite, accuracy assessment of maps derived from remote sensing, and methodologies to detect changes such as urbanization, deforestation, vegetation <u>health, and wildfires.</u>
BIO 328	Managing Biodiversity Change: from Science to Policy		X	This course will explore key topics in management of biodiversity change at the science-policy interface. The topics will often be approached from an Iberian and Latin American perspective. Topics to be covered include: protected area management, ecological rewilding of abandoned farmland, agri-environmental schemes, developing biodiversity monitoring programs, developing biodiversity scenarios and identifying regional tipping points ecosystems; assessments across scales for the Intergovernmental Platform on Biodiversity and Ecosystem Services.
BIOC 459	Frontiers in Interdisciplinary Biosciences (Same as CHEMENG 459, BIOE 459, PSYCH 459, BIO 459, CHEM 459)	X		Students register through their affiliated department; otherwise register for CHEMENG 459. For specialists and non-specialists. Sponsored by the Stanford BioX Program. Three seminars per quarter address scientific and technical themes related to interdisciplinary approaches in bioengineering, medicine, and the chemical, physical, and biological sciences. Leading investigators from Stanford and the world present breakthroughs and endeavors that cut across core disciplines. Pre-seminars introduce basic concepts and background for non-experts. Registered students attend all pre-seminars; others welcome. See <a href="http://biox.stanford.edu/courses/459.html">http://biox.stanford.edu/courses/459.html</a> .
BIOE 131	Ethics in Bioengineering (Same as ETHICSOC 131X)	X		Bioengineering focuses on the development and application of new technologies in the biology and medicine. These technologies often have powerful effects on living systems at the microscopic and macroscopic level. They can provide great benefit to society, but they also can be used in dangerous or damaging ways. These effects may be positive or negative, and so it is critical that bioengineers understand the basic principles of ethics when thinking about how the technologies they develop can and should be applied. On a personal level, every bioengineer should understand the basic principles of ethical behavior in the professional setting. This course will involve substantial writing, and will use case-study methodology to introduce both societal and personal ethical principles, with a focus on practical <u>applications.</u>
BIOE 141A	Senior Capstone Design I	X		Lecture/Lab. First course of two-quarter capstone sequence. Team based project introduces students to the process of designing new biological technologies to address societal needs. Topics include methods for validating societal needs, brainstorming, concept selection, and the engineering design process. First quarter deliverable is a design for the top concept. Second quarter involves implementation and testing. Guest lectures and practical demonstrations are <u>incorporated.</u>

BIOE 141B	Senior Capstone Design II	X		Lecture/Lab. Second course of two-quarter capstone sequence. Team based project introduces students to the process of designing new biological technologies to address societal needs. Emphasis is on implementing and testing the design from the first quarter with the at least one round of prototype iteration. Guest lectures and practical demonstrations are incorporated. Prerequisites: BIOE123 and BIOE44. This course is open only to seniors in the undergraduate Bioengineering program. <b>IMPORTANT NOTE: class meets in Shriram 112.</b>
BIOE 393	Bioengineering Departmental Research Colloquium	X		Bioengineering department labs at Stanford present recent research projects and results. Guest lecturers. Topics include applications of engineering to biology, medicine, biotechnology, and medical technology, including biodesign and devices, molecular and cellular engineering, regenerative medicine and tissue engineering, biomedical imaging, and biomedical computation. Aut. Win. Spr (Lin. Riedel-Kruse, Barron)
BIOHOPK 43	Plant Biology, Evolution, and Ecology		X	Introduction to biology in a marine context. Principles of plant biology: physiology, structure, diversity. Principles of evolution: macro and microevolution, population genetics. Ecology: the principles governing the distribution and abundance of organisms; population, community, and ecosystem ecology. Equivalent to BIO 43.
BIOHOPK 47	Core Laboratory in Plant Biology, Ecology and Evolution		X	Laboratory and field projects provide working familiarity with the concepts, organisms, and techniques of plant and evolutionary biology, and ecology. Emphasis is on hands-on experimentation in the marine environment, analysis of data, and written and oral presentation of the experiments.
BIOHOPK 168H	Disease Ecology: from parasites evolution to the socio-economic impacts of pathogens on nations (Same as BIOHOPK 268H)	X		(Graduate students register for 268H.) Course will lead participants on a journey through the dynamics of infectious diseases that will start at the smallest level from within-host parasite dynamics and will progressively scale up to parasite evolution, disease ecology, public health policies, disease driven poverty traps and the socio-economic impact of infectious diseases on nations. The course will be organized around case studies, including among the others, schistosomiasis, malaria, cholera and sleeping sickness. Participants will have the opportunity to develop a capstone project
BIOHOPK 173H	Marine Conservation Biology (Same as BIOHOPK 273H)		X	(Graduate students register for 273H.) Introduction to the key concepts of ecology and policy relevant to marine conservation issues at the population to ecosystems level. Focus on the origin and maintenance of biodiversity and conservation applications from both the biology and policy perspectives (for example, endangered species, captive breeding, reserve design, habitat fragmentation, ecosystem restoration/rehabilitation). Also includes emerging approaches such as ecosystem based management, ocean planning, and coupled social-ecological systems. The course will include lectures, readings and discussions of primary literature, and attendance at seminars with visiting scholars.
BIOHOPK 174H	Experimental Design and Probability (Same as BIOHOPK 274H)	X		(Graduate students register for 274H.) Variability is an integral part of biology. Introduction to probability and its use in designing experiments to address biological problems. Focus is on analysis of variance, when and how to use it, why it works, and how to interpret the results. Design of complex, but practical, asymmetrical experiments and environmental impact studies, and regression and analysis of covariance. Computer-based data analysis. Prerequisite: Biology core or consent of instructor.
BIOHOPK 177H	Dynamics and Management of Marine Populations (Same as BIOHOPK 277H)	X		(Graduate students register for 277H.) Course examines the ecological factors and processes that control natural and harvested marine populations. Course emphasizes mathematical models as tools to assess the dynamics of populations and to derive projections of their demographic fate under different management scenarios. Course objectives will be met by a combination of theoretical lectures, assigned readings and class discussions, case study analysis and interactive computer sessions.
BIOHOPK 234H	Topics in Comparative and Environmental Physiology	X		Seminar and discussion focused on current topics and research at the interface of physiology and ecology
BIOHOPK 279H	Physiological Ecology of Marine Megafauna (Same as BIOHOPK 179H)	X		The ocean is home to the largest animals of all-time. How, when, and why did gigantism evolve in different taxa? What are the consequences of large body size? This course will focus on how biological processes scale with body size, with an emphasis on oceanic megafauna including marine mammals, birds, fishes, and reptiles. In particular, the course will explore the functional mechanisms that generate the scaling relationships for physiological and ecological traits, such as metabolism, ecosystem function and body size evolution. Students will also be introduced to state-of-the-art technologies used to student marine megafauna in some of the most logistically challenging habitats on earth.
BIOHOPK 281H	Physiology of Global Change (Same as BIOHOPK 181H)		X	Global change is leading to significant alterations in several environmental factors, including temperature, ocean acidity and oxygen availability. This course focuses on: (i) how these environmental changes lead to physiological stress and (ii) how, and to what extent, are organisms able to adapt through short-term acclimatization and evolutionary adaptation to cope with these stresses. A major focus of the class is to link changes in species' distribution patterns with underlying physiological mechanics that establish environmental optima and tolerance limits.
BIOS 225	Diversity and Inclusion in Science	X		Introduction to the social science literature on factors contributing to gender disparities in the scientific workplace (e.g. implicit bias and stereotype threat). Discussions focus on steps that individuals and institutions can take to promote the advancement of women and other underrepresented groups in science, and thus promote the advancement of science.

BIOS 251	Biotechnology in the Natural World (Same as SBIO 251)	X		Life can be found in some of the strangest and most inhospitable places of Earth. Whether in hot springs, oceanic depths, or dense rainforests, living organisms must be natural specialists to survive. This course explores a selection of strange and ingenious biomolecules that natural organisms have evolved in order to survive. Lectures will cover historical background as well as detailed investigations of the structure and function of selected biomolecules of interest. The majority of each lecture and discussion will focus on the adaptation of those molecules for fundamental and innovative approaches in modern biotechnology, especially in medicine and biophotonics. Key biophysical and biochemical techniques will be discussed as they are encountered within primary literature.
BIOS 252	Experimental strategies for understanding plant-environmental responses	X		This minicourse will explore the specific aspects of the environment that plants sense, the impacts these stimuli have on plant physiology and the state-of-the-art in experimental methods used to study plant-environmental interactions. Each week will include a lecture, group discussion and lab focused on one of three key environments: the soil, canopy and agricultural field. Lectures will provide necessary background information, literature-based discussions will evaluate current methods and identify areas where innovation is needed, and labs will include demonstrations of several common methods and a trip to the Salinas Valley to visit a farm.
BIOS 258	Ethics, Science, and Society	X		This discussion focused Ethics, Science, and Society interactive mini course will engage Biosciences graduate students and faculty in learning and conversations on topics in responsible research (including animal subjects, authorship, collaboration, conflicts of interest, data management, human subjects, mentor-mentee relationships, peer review, publication, research misconduct, and social responsibility) and diversity in science, informed by readings, case studies, individual reflections, and more. Some of the driving themes in this course include: what it means to do research well and how to and not to achieve this, why doing research well and with integrity is important, and who are researchers currently and who should they be.
CEE 1	Introduction to Environmental Systems Engineering	X		Field trips visiting environmental systems installations in Northern California, including coastal, freshwater, and urban infrastructure. Requirements: Several campus meetings, and field trips. Enrollment limited; priority given to undergraduates who have declared Environmental Systems Engineering major. Contact hildemann@stanford.edu to request enrollment/permission code.
CEE 29N	Managing Natural Disaster Risk	X		Natural disasters arise from the interaction of natural processes, such as earthquakes or floods, with human development that suffers safety-related and economic losses. We cannot predict exactly when those disasters will occur, or prevent them entirely, but we have a number of engineering and policy options that can reduce the impacts of such events.
CEE 32U	California Modernism: The Web of Apprenticeship	X		This course will study at the development of Modernism in pre and post WWII California. The class will investigate responses to climatic, technological, and cultural changes that were specific to the state but have now become an idealized tread. We will look at architects and landscape architects who apprenticed with significant design leaders and track how their involvement and explore resulted in changes in building technologies, and influenced the next generation of design thinking and experimentation. The investigations will occur through research, drawings and models, as well as site visits.
CEE 32V	Architectural Design Lecture Series Course	X		Seminar will be a companion to the Spring Architecture and Landscape Architecture Lecture Series. Students will converse with lecturers before the lectures, attend the lecture, and prepare short documents (written, graphic, exploratory) for two of the lectures.
CEE 32W	Making Meaning: A Purposeful Life in Design	X		As designers, how do we lead a life with meaning? What is a fulfilling life in design and how do we develop personal and professional practices that support this aim? This experiential course will explore how to nourish a purposeful life amidst a culture that can value productivity over presence in the field, identifying "busyness" as a marker of personal worth. How do we bring depth to not only the design process but our individual and collective lives as well? Investigations will include: exploring personal passions, discovering meaningful work in design, understanding work/life/play balance, practicing self-reflection, integrating wellness, cultivating community, and practicing design with integrity. Our time in class will be enjoyed sharing meals, discourse, play, and reflections with both the class cohort and designers that lead lives or purpose and meaning.
CEE 63	Weather and Storms (Same as CEE 263C)	X		Daily and severe weather and global climate. Topics: structure and composition of the atmosphere, fog and cloud formation, rainfall, local winds, wind energy, global circulation, jet streams, high and low pressure systems, inversions, el Niño, la Niña, atmosphere/ocean interactions, fronts, cyclones, thunderstorms, lightning, tornadoes, hurricanes, pollutant transport, global climate and atmospheric optics.
CEE 64	Air Pollution and Global Warming: History, Science, and Solutions (Same as CEE 263D)		X	Survey of Survey of air pollution and global warming and their renewable energy solutions. Topics: evolution of the Earth's atmosphere, history of discovery of chemicals in the air, bases and particles in urban smog, visibility, indoor air pollution, acid rain, stratospheric and Antarctic ozone loss, the historic climate record, causes and effects of global warming, impacts of energy systems on pollution and climate, renewable energy solutions to air pollution and global warming. UG Reqs: GFR: DBNatSci
CEE 100	Managing Sustainable Building Projects		X	Managing the life cycle of buildings from the owner, designer, and contractor perspectives emphasizing sustainability goals; methods to define, communicate, coordinate, and manage multidisciplinary project objectives including scope, quality, life cycle cost and value, schedule, safety, energy, and social concerns; roles, responsibilities, and risks for project participants; virtual design and construction methods for product, organization, and process modeling; lifecycle assessment methods; individual writing assignment related to a real world project.

CEE 101B	Mechanics of Fluids	X		Physical properties of fluids and their effect on flow behavior; equations of motion for incompressible ideal flow, including the special case of hydrostatics; continuity, energy, and momentum principles; control volume analysis; laminar and turbulent flows; internal and external flows in specific engineering applications including pipes, open channels, estuaries, and wind turbines.
CEE 101C	Geotechnical Engineering	X		Introduction to the principles of soil mechanics. Soil classification, shear strength and stress-strain behavior of soils, consolidation theory, analysis and design of earth retaining structures, introduction to shallow and deep foundation design, slope stability. Lab projects.
CEE 102	Legal Principles in Design, Construction, and Project Delivery	X		Introduction to the key legal principles affecting design, construction and the delivery of infrastructure projects. The course begins with an introduction to the structure of law, including principles of contract, negligence, professional responsibility, intellectual property, land use and environmental law, then draws on these concepts to examine current and developing means of project delivery.
CEE 120A	Building Information Modeling Workshop (Same as CEE 220A)	X		The foundational Building Information Modeling course introduces techniques for creating, managing, and applying of building information models in the building design and construction process. The course covers processes and tools for creating, organizing, and working with 2D and 3D computer representations of building components and geometries to produce models used in architectural design, construction planning and documentation, rendering and visualization, simulation and analysis.
CEE 126A	Stanford Sustainable Living Lab I		X	This course introduces students to the concepts of industrial ecology, sustainability science, and green thinking. The quarter-long focus of the course will be a quantitative and qualitative assessment of the sustainability of an on-campus system. Examples of such systems are an on-campus dormitory (e.g. Roble Hall), service provider (e.g. Axe and Palm Restaurant), or infrastructure system (e.g. campus water system). Students interested in the course as a seminar should elect for the 1 unit option. Students interested in the course to fulfill programmatic requirements should elect for the 3 unit option.
CEE 126B	Stanford Sustainable Living Lab II		X	This course introduces students to the concepts of sustainability economics, system optimization, and life cycle costing. In essence, students will be building the "business case" for various proposed sustainability efforts tied to an on-campus system. Examples of such systems are on an on-campus dormitory (.e.g Roble Hall), service provider (e.g. Axe and Palm Restaurant), or infrastructure system (e.g. campus water system).
CEE 126X	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas (Same as EARTH 126X)		X	Stanford's graduate students are a trove of knowledge -- and, just as important, curiosity -- about environmental sustainability. This seminar will feature talks by graduate students that explore the biggest, most bedeviling questions about environmental sustainability locally and around the world. The course will be structured as follows: every other week, we will hear hour-long graduate student talks about sustainability questions and their research, and on the off weeks, we will discuss the unanswered, debatable questions that relate to the previous week's talk.
CEE 126Z	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas (Same as EARTH 126Z)		X	Stanford's graduate students are a trove of knowledge -- and, just as important, curiosity -- about environmental sustainability. This seminar will feature talks by graduate students that explore the biggest, most bedeviling questions about environmental sustainability locally and around the world. The course will be structured as follows: every other week, we will hear hour-long graduate student talks about sustainability questions and their research, and on the off weeks, we will discuss the unanswered, debatable questions that relate to the previous week's talk.
CEE 131C	How Buildings are Made -- Materiality and Construction Methods	X		This course will provide an introduction to the materials and methods used in building construction. A combination of in-class lectures, reading assignments, and building site visits will provide students with an awareness of construction materials and their use within building systems. All relevant building types and construction materials will be explored, including wood, steel, concrete and masonry. Building foundations and basic structural systems will be explained. Building envelope elements will be considered, with an analysis of various glass and glazing materials, cladding types, and roofing systems. Interior Floor, wall and ceiling finishes will be discussed. New and emerging building trends will also be examined, wuch as prefabricated and modular construction. Guest presenters, drawn from Bay Area consulting firms, will cover several topics of interest. Students will have an opportunity to experience real world material applications at local construction sites, and gain a thorough understanding of the construction process.
CEE 134B	Intermediate Arch Studio (Same as CEE 234B)	X		This studio offers students experience in working with a real site and a real client program to develop a community facility. Students will develop site analysis, review a program for development and ultimately design their own solutions that meet client and community goals. Sustainability, historic preservation, community needs and materials will all play a part in the development of students final project. Students will also gain an understanding of graphic conventions, verbal and presentation techniques.
CEE 144	Design and Innovation for the Circular Economy	X		The last 150 years of our industrial evolution have been material and energy intensive. The linear model of production and consumption manufactures goods from raw materials, wells and uses them, and then discards the products as waste. Circular economy provides a framework for systems-level redesign. It builds on schools of thought including regenerative design, performance economy industrial ecology, blue economy, biomimicry, and cradle to cradle. This course introduces the concepts of the circular economy and applies them to case studies of consumer products, household goods, and fixed assets. nStudents will conduct independent projects on circular economy. Students may work alone or in small teams under the guidance of the teaching team and various collaborators worldwide. Class is limited to 14 students. All disciplines are welcome. This class fulfills the Writing & Rhetoric 2 requirement. Prerequisite: RWB 1

CEE 161C	Natural Ventilation of Buildings	X		An introduction to natural ventilation design, including an in-depth discussion of the fluid mechanics of natural ventilation, and a review of models and measurements of naturally ventilated buildings. Overview of the design process, from assessing feasibility to commissioning. Discussion of physical processes in natural ventilation, including buoyancy- and wind- driven flow, and important fluid mechanics and heat transfer concepts and equations. Steady flow characteristics of openings, steady and unsteady envelope models. Internal air motion, zonal models and stratification. CFD and its applications, scale modeling and full-scale measurements. Throughout the course the Y2E2 building natural ventilation system and temperature measurements will be used to illustrate the different concepts and methods.
CEE 162F	Coastal Engineering	X		This course provides an introduction to the relevant processes that shape the coastline, including the hydrodynamical forcing and the resultant coastal morphology. It discusses the natural response of coastal systems to forcing by the environment (e.g. waves, tides, storms), discusses how these affect the sediment budget along the coast, and uses this to explain typical coastal features. Finally we consider different engineering solutions that are available to mitigate erosion, how they influence the system, and what their relative advantages and disadvantages are. Prereq: CEE 101B or equivalent
CEE 166A	Watersheds and Wetlands (Same as CEE 266A)		X	Introduction to the occurrence and movement of water in the natural environment and its role in creating and maintaining terrestrial, wetland, and aquatic habitat. Hydrologic processes, including precipitation, evaporation, transpiration, snowmelt, infiltration, subsurface flow, runoff, and streamflow. Rivers and lakes, springs and swamps. <b>Emphasis is on observation and measurement, data analysis, modeling, and prediction.</b>
CEE 169	Environmental and Water Resources Engineering Design		X	Application of fluid mechanics, hydrology, water resources, environmental sciences, and engineering economy fundamentals to the design of a system addressing a complex problem of water in the natural and constructed environment. Problem changes each year, generally drawn from a challenge confronting the University or a local community. Student teams prepare proposals, progress reports, oral presentations, and a final design report.
CEE 171	Environmental Planning Methods		X	Intended primarily for juniors and seniors; first year graduate students welcome. Course introduces key environmental policy design and implementation concepts and provides opportunities to work with a range of environmental planning methods. Environmental laws and regulations (e.g., US Clean Water Act and the US National Environmental Policy Act) are examined. Course demonstrates how firms have gone beyond regulatory compliance and introduced environmental sustainability issues into core business strategies. Course uses a simulated negotiation of a financial penalty between a student team representing the US EPA (and other government agencies) and a team representing a firm that is out of compliance with Clean Water Act regulations. Professionals with experience in such negotiations provide coaching for student teams
CEE 172	Air Quality Management		X	Quantitative introduction to the engineering methods used to study and seek solutions to current air quality problems. Topics: global atmospheric changes, urban sources of air pollution, indoor air quality problems, design and efficiencies of <b>pollution control devices, and engineering strategies for managing air quality.</b>
CEE 174A	Providing Safe Water for the Developing and Developed World		X	This course will cover basic hydraulics and the fundamental processes used to provide and control water, and will introduce the basics of engineering design. In addition to understanding the details behind the fundamental processes, students will learn to feel comfortable developing initial design criteria (30% designs) for fundamental processes. Students should also develop a feel for the typical values of water treatment parameters and the equipment involved. The course should enable students to work competently in environmental engineering firms or on non-profit projects in the developing world such as Engineers without Borders. Pre-requisite: Chem31B/X.
CEE 174B	Wastewater Treatment: From Disposal to Resource Recovery	X		This course builds upon CEE 174A, covering basic hydraulics and the fundamental processes used to treat wastewater. In addition to understanding the details behind the fundamental processes, students will learn to feel comfortable developing initial design criteria (30% designs) for fundamental processes. Students should also develop a feel for the typical values of water treatment parameters and the equipment involved. After covering conventional processes, the class addresses newer processes used to meet emerging treatment objectives, including nutrient removal, composting of biosolids and recycling of wastewater for beneficial uses, including potable reuse. Pre-requisites: CEE 174A.
CEE 176A	Energy Efficient Buildings		X	Analysis and design. Thermal analysis of building envelope, heating and cooling requirements, HVAC, and building <b>integrated PV systems. Emphasis is on residential passive solar design and solar water heating. Lab.</b>
CEE 176B	Electric Power: Renewables and Efficiency		X	This course introduces analysis, sizing and performance estimations (electrical and financial) of renewable energy systems on both sides of the electric meter with an emphasis on photovoltaics and wind-power systems. Basic electric power generation, transmission and distribution, as well as distributed generation will be introduced. Optional <b>Laboratory section for a 4th unit of credit.</b>
CEE 177	Aquatic Chemistry and Biology	X		Introduction to chemical and biological processes in the aqueous environment. Basic aqueous equilibria; the structure, behavior, and fate of major classes of chemicals that dissolve in water; redox reactions; the biochemistry of aquatic microbial life; and biogeochemical processes that govern the fate of nutrients and metals in the environment and in <b>engineered systems.</b>

CEE 177X	Current Topics in Sustainable Engineering (Same as CEE 277X)		X	This course is the first half of a two quarter, project-based design course that addresses the cultural, political, organizational, technical, and business issues at the heart of implementing sustainable engineering projects in the developing world. Students will be placed into one of three project teams and tackle a real-world design challenge in partnership with social entrepreneurs and NGOs. In CEE 177X/277X, students will gain the background skills and context necessary to effectively design engineering projects in developing nations. Instructor consent required.
CEE 179A	Water Chemistry Laboratory (Same as CEE 273A)	X		Laboratory application of techniques for the analysis of natural and contaminated waters, emphasizing instrumental techniques.
CEE 183	Integrated Civil Engineering Design Project	X		Studio format. Design concepts for civil engineering facilities from schematic design through construction, taking into account sustainable engineering issues. Design exercises culminating in the design of a civil engineering facility, emphasizing structural systems and materials and integration with architectural, construction and other project requirements.
CEE 201D	Computations in Civil and Environmental Engineering (Same as CEE 101D)	X		Computational and visualization methods in the design and analysis of civil and environmental engineering systems. Focus is on applications of MATLAB. How to develop a more lucid and better organized programming style.
CEE 206	Decision Analysis for Civil and Environmental Engineers		X	Current challenges in selecting an appropriate site, alternate design, or retrofit strategy based on environmental, economic, and social factors can be best addressed through applications of decision science. Basics of decision theory, including development of decision trees with discrete and continuous random variables, expected value decision making, utility theory value of information, and elementary multi-attribute decision making will be covered in the class. Examples will cover many areas of civil and environmental engineering problems.
CEE 207F	Understanding Energy -- Field Trips (Same as EARTHYSYS 103F, CEE 107F)		X	Understanding Energy - Field Trips takes students on trips to major energy resource sites located within a few hours of Stanford University. Students visit at least two of the many field trips offered, including to a nuclear power plant, a wind farm, a geothermal facility, a solar photovoltaic (PV) farm, a hydroelectric power plant, an oil field, and a natural gas-fired power plant, among others (field trips offered may vary by quarter). Students meet 7-8 times during the quarter to debrief previous field trips and prepare for future ones. Open to all majors and backgrounds. Understanding Energy - Field Trips is part of a trio of inter-related courses aimed at gaining an in-depth understanding of each energy resource -- from fossil fuels to renewable energy. The other two courses are CEE 107A/207A & EARTHYSYS 103 Understanding Energy, and CEE 107W/207W & EARTHYSYS 103W Understanding Energy - Workshop. Priority is given to students who have taken or are concurrently enrolled in CEE 173A, CEE 107A, CEE 207A, EARTHYSYS 103, or CEE 107F/207F.
CEE 209B	Disaster Risk and International Development Seminar		X	The human and economic impacts of natural disasters are ever increasing and disproportionately affecting lower-income countries. In fact there is mounting evidence that these ever more frequent shocks threaten to reverse development progress in low-income countries. This seminar course will explore the theory and practice of disaster risk reduction in international development contexts. Weekly readings (and occasional guest lectures) will cover key issues in development theory, a history of "a risk society", participation, human-centered planning, ethics in engineering, and other topics. The seminar will be structured through weekly readings, brief writing responses and group discussion.
CEE 212A	Industry Applications of Virtual Design & Construction	X		Building upon the concept of the VDC Scorecard, CEE 112A/212A investigates in the management of Virtual Design and Construction (VDC) programs and projects in the building industry. Interacting with experts and professionals in real estate, architecture, engineering, construction and technology providers, students will learn from the industry applications of Building Information Modeling and its relationship with Integrated Project Delivery, Sustainable Design and Construction, and Virtual Design and Construction. Students will conduct case studies to evaluate the maturity of VDC planning, adoption, technology and performance in practice. Students taking 3 or 4 units will be paired up with independent research or case study projects on the industry applications of VDC. No prerequisite. See CEE 112B/212B in the Winter Quarter and CEE 112C/212C in the Spring Quarter.
CEE 212B	Industry Applications of Virtual Design & Construction (Same as CEE 212B)	X		CEE 112B/212B is a practicum on the Industry Applications on Virtual Design and Construction (VDC). Students will gain insights and develop skills that are essential for academic research, internships or industry practice in VDC and Building Information Modeling (BIM). Students can choose between one of the two project topics: [1] Industrialized Construction with Virtual Parts (No Prerequisite) or [2] Industry Benchmarking & Applications of the VDC Management Scorecard (Suggested Prerequisite: CEE 112A/212A).
CEE 220B	Building Information Modeling Workshop (Same as CEE 120B)	X		This course builds upon the Building Information Model concepts introduced in 120A/220A and illustrates how BIM modeling tools are used to design, analyze, and model building systems including structural, mechanical, electrical, plumbing and fire protection. Course covers the physical principles, design criteria, and design strategies for each system and explores processes and tools for modeling those systems and analyzing their performance. Topics include: building envelopes, access systems, structural systems modeling and analysis, mechanical / HVAC systems, plumbing and fire protection systems, electrical systems, and systems integration/coordination.
CEE 220S	Building Information Modeling Special Study (Same as CEE 120S)	X		Special studies of Building Information Modeling strategies and techniques focused on creating, managing, and applying models in the building design and construction process. Processes and tools for creating, organizing, and working with 2D and 3D computer representations of building components to produce models used in design, construction planning, visualization, and analysis.

CEE 222B	Computer Integrated Architecture/Engineering/Construction (AEC) Global Teamwork	X		Global AEC student teams continue their project activity focusing on the most challenging concept developed in 222A and chosen jointly with their client. Comprehensive team project focusing on design and construction, including: project development and documentation; detailing, 3D and 4D modeling, simulation, sustainable concepts, cost benefit analysis, and life-cycle cost analysis; and final project presentation of product and process.
CEE 223	Materials for Sustainable Built Environments		X	In this course, students will learn about new and traditional construction materials for use in sustainable building and infrastructure projects. Materials will include cement-based materials and fiber-reinforced polymer composites for structural and non-structural applications, as well as novel materials for e.g., facades, insulation, and paving. Material properties, their performance over time and their impact on people and the environment will be discussed.
CEE 224S	Sustainable Urban Systems Seminar		X	The Sustainable Urban Systems (SUS) Seminar Series will feature speakers from academia, practice, industry, and government who are on the forefront of research and innovation in sustainable urban systems. The SUS Seminar will be open to the public; students will have the option of obtaining 1 unit of course credit based on attendance and completion of writing assignments.
CEE 224X	Sustainable Urban Systems Project		X	A year-long Project-Based Learning course on sustainable urban systems, in collaboration with Sechuan University, Chengdu, China. Students will form multidisciplinary teams of 8-10 and be assigned to study one of two cities: Chengdu, CN and San Jose, CA. Teams will work closely with city partners including municipal officials, industry leaders, community groups, and local academics. First phase conducting research using geospatial data analysis of key performance indicators, second and third phases to address target goals identified in phase one. Teams will propose innovative plans, policies and/or programs for urban development to meet goals. Three quarter commitment preferred, two quarter commitment required. Enrollment limited to ten Stanford students by application. Preference to CEE graduate students within CEE (SDC) and from other departments, upperclass undergraduate applications accepted.
CEE 224Y	Sustainable Urban Systems Project		X	Sustainable Urban Systems Project: San Jose is a selective opportunity to engage in a unique, real-world learning experience being piloted for a new Sustainable Urban Systems initiative within the Department of Civil and Environmental Engineering. It combines a project-based learning model with real-world problem-solving in an urban setting. Building off student work conducted in Fall and Winter quarters, Spring quarter students will work with planners in the City of San Jose to develop strategic solutions for high-priority challenges like affordable housing, stormwater management, and transit-oriented mixed-use development immersive trips to San Jose are a core part of the Spring quarter learning experience and students will engage in a variety of community activities throughout the quarter.
CEE 224Z	Sustainable Urban Systems Project		X	Sustainable Urban Systems Project: San Jose is a selective opportunity to engage in a unique, real-world learning experience being piloted for a new Sustainable Urban Systems initiative within the Department of Civil and Environmental Engineering. It combines a project-based learning model with real-world problem-solving in an urban setting. Building off student work conducted in Fall and Winter quarters, Spring quarter students will work with planners in the City of San Jose to develop strategic solutions for high-priority challenges like affordable housing, stormwater management, and transit-oriented mixed-use development immersive trips to San Jose are a core part of the Spring quarter learning experience and students will engage in a variety of community activities throughout the quarter.
CEE 225	Defining Smart Cities: Visions of Urbanism for the 21st Century (Same as CEE 125, URBANST 174)		X	In a rapidly urbanizing world, "the city" paves the way toward sustainability and social well-being. But what does it mean for a city to be smart? Does that also make it sustainable or resilient or livable? This seminar delves into current debates about urbanism through weekly talks by experts on topics such as big data, human-centered design, new urbanism, and natural capital. How urban spaces are shaped, for better or worse, by the complex interaction of cutting-edge technology, human societies, and the natural environment. The goal is to provoke vigorous discussion and to foster an understanding of cities that is at once technological, humanistic, and ecologically sound.
CEE 226	Life Cycle Assessment for Complex Systems		X	Life cycle modeling of products, industrial processes, and infrastructure/building systems; material and energy balances for large interdependent systems; environmental accounting; and life cycle costing. These methods, based on ISO 14000 standards, are used to examine emerging technologies, such as biobased products, building materials, building integrated photovoltaics, and alternative design strategies, such as remanufacturing, dematerialization, LEED, and Design for Environment: DfE. Student teams complete a life cycle assessment of a product or system chosen from industry.
CEE 226E	Advanced Topics in Integrated, Energy-Efficient Building Design		X	Innovative methods and systems for the integrated design and evaluation of energy efficient buildings. Guest practitioners and researchers in energy efficient buildings. Student initiated final project. Prerequisites: CEE 156 or CEE 256. All students are expected to participate in the group project assignments. Students taking the course for two units will not be required to complete in-class assignments or individual homework assignments.
CEE 227	Global Project Finance	X		Public and private sources of finance for large, complex, capital-intensive projects in developed and developing countries. Benefits and disadvantages, major participants, risk sharing, and challenges of project finance in emerging markets. Financial, economic, political, cultural, and technological elements that affect project structures, processes, and outcomes. Case studies.

CEE 241A	Infrastructure Project Development (Same as CEE 141A)	X		Infrastructure is critical to the economy, global competitiveness and quality of life. Topics include energy, transportation, water, public facilities, and communications sectors. Analysis of the condition of the nation's infrastructure and how projects are planned and financed. Focus is on public works in the U.S. The role of public and private sectors through a step-by-step study of the project development process. Case studies of real infrastructure projects. Industry guest speakers. Student teams prepare project environmental impact statements.
CEE 241B	Infrastructure Project Delivery (Same as CEE 141B)	X		Infrastructure is critical to the economy, global competitiveness and quality of life. Topics include energy, transportation, water, public facilities, and communications sectors. Analysis of how projects are designed, constructed, operated, and maintained. Focus is on public works projects in the U.S. Alternative project delivery approaches and organizational strategies. Case studies of real infrastructure projects. Industry guest speakers. Student teams prepare finance/design/build/operate/maintain project proposals.
CEE 241C	Global Infrastructure Projects Seminar (Same as CEE 141C)	X		Real infrastructure projects presented by industry guest speakers. Energy, transportation, water, public facilities and communications projects are featured. Course provides comparisons of project development and delivery approaches for mega-projects around the world. Alternative project delivery methods, the role of public and private sector, different project management strategies, and lessons learned. Field trips to local projects.
CEE 241P	Integrated Management of Fabrication and Construction	X		Application of the fundamental fabrication and construction management concepts covered in CEE 241T to an actual project; integrated software environments; integration of scope, schedule, and cost information for scheduling, estimating, and progress control; scope management with BIM; off-site fabrication vs. on-site construction and supply chain coordination; group project; project permitting, potential for a joint project with CEE 242P. Prerequisites: CEE 210, CEE 241T.
CEE 243	Intro to Urban Sys Engrg		X	This course is an introduction to the interdisciplinary domain of urban systems engineering. It will provide you with a high-level understanding of the motivation for studying sustainable cities and urban systems, systems-based modeling approaches and the social actor theories embedded in the urban sustainability decision making process. Coursework will be comprised of three group mini-projects corresponding to course modules.
CEE 244A	Sustainable Banking Seminar		X	This seminar explores ideas for redesigning banks and the banking sector to achieve three goals: (1) keep the bank and its depositors safe, (2) keep the borrowers, communities, and societies affected by the bank's lending decisions safe, and (3) use bank transactions to improve the sustainability of natural ecosystems. Weekly speakers include bankers, bank regulators, and financial technology (fintech) innovators focused on sustainable banking.
CEE 246	Entrepreneurship in Civil & Environmental Engineering	X		CEE 246 is a team project-based course geared toward developing entrepreneurial businesses related to civil and environmental engineering. With support of industry mentors, students are guided through the process of identifying opportunities, developing business plans, and determining funding sources. The class culminates with presentations to industry experts and venture capitalists (VC) to mimic typical investor pitches. The goal is to provide students with the knowledge and network to realize their business idea. Students must submit the following application before enrolling in this course: <a href="https://go.ql/forms/E6111u19x2120tR8D2">https://go.ql/forms/E6111u19x2120tR8D2</a>
CEE 246A	Engineering Economy (Same as CEE 146A)	X		Fundamentals of financial and economic analysis. Engineering Economy Principles. Interest rates, Present value, annual cash flow, internal rate of return, benefit-cost analysis. Economic Life, Life Cycle Costs. Replacement analysis. Project Selection - Mutually Exclusive Alternatives, Multiple Objective Criteria. Depreciation. Inflation and Taxes. Sensitivity and risk analysis. Uncertainty and Probability. Decision Trees. Capital Budgeting.
CEE 246B	Real Estate Development and Finance	X		Introduction to the Real Estate Development Process from conception, feasibility analysis, due diligence, entitlements, planning, financing, market analysis, contract negotiation, construction, marketing, asset management and disposition. Pro-forma and Financial modeling in Real Estate. Financing options for different types of Real Estate projects and products. Redevelopment projects. Affordable Housing. The class will combine lectures, case studies, field work (Group Project) and guest speakers. Recommended knowledge of spreadsheets. Enrollment limited to 40; no auditors. Instructor consent is required. Only Seniors or Grad students. Students must please kindly email the instructor a short paragraph indicating if they are an undergrad or grad student, their current year (Frosh/Soph/Junior or Senior), their Department and Program, and their reason for taking the class.
CEE 252Q	Construction Engineering Fundamentals	X		Construction engineering is a series of technical activities to meet project objectives related to cost and schedule, safety, quality, and sustainability. These activities include: 1) designing temporary works and construction work processes; 2) providing the required temporary and permanent resources; and 3) integrating activities to consider construction during all project phases and between projects. The objectives of CEE 252Q are to learn about the technical fundamentals, resources, and field operations required to complete construction engineering activities and to develop a foundation for continued related learning. The course requires reviewing recorded presentations and other online resources, completing queries, participating in class sessions with guest speakers and in field trips, and completing group exercises and projects. The exercises, completed by all of the student groups, include construction engineering activities for earthwork, concrete construction, and steel erection. Each group will also complete a project to analyze one of the following types of systems or facilities: building electrical systems, lighting systems, HVAC systems, control systems, solar photovoltaic power plant, and wind turbine power plant.

CEE 256	Building Systems (Same as CEE 156)		X	HVAC, lighting, and envelope systems for commercial and institutional buildings, with a focus on energy efficient design. Knowledge and skills required in the development of low-energy buildings that provide high quality environment for occupants.
CEE 258	Donald R. Watson Seminar in Construction Engineering and Management	X		Presentations from construction industry leaders. Discussions with speakers from various segments of industry regarding career options. Student groups interact with industry representatives after class.
CEE 262B	Transport and Mixing in Surface Water Flows	X		Application of fluid mechanics to problems of pollutant transport and mixing in the water environment. Mathematical models of advection, diffusion, and dispersion. Application of theory to problems of transport and mixing in rivers, estuaries, and lakes and reservoirs. Recommended: 262A and CME 102 (formerly ENGR 155A), or equivalents.
CEE 262C	Modeling Environmental Flows	X		Introduction to numerical methods for modeling surface water flows in rivers, lakes, estuaries and the coastal ocean. Topics include stability and accuracy analysis, curvilinear and unstructured grids, implicit/explicit methods, transport and diffusion, shallow water equations, nonhydrostatic equations, Navier-Stokes solvers, turbulence modeling.
CEE 262E	Rivers, Streams, and Canals (Same as CEE 162E)	X		Introduction to the movement of water through natural and engineered channels, streams, and rivers. Basic equations and theory (mass, momentum, and energy equations) for steady and unsteady descriptions of the flow. Application of theory to the design of flood- control and canal systems. Flow controls such as weirs and sluice gates; gradually varied flow; Saint-Venant equations and flood waves; and method of characteristics. Open channel flow laboratory experiments: controls such as weirs and gates, gradually varied flow, and waves.
CEE 263C	Weather and Storms (Same as CEE 63)	X		Daily and severe weather and global climate. Topics: structure and composition of the atmosphere, fog and cloud formation, rainfall, local winds, wind energy, global circulation, jet streams, high and low pressure systems, inversions, el Niño, la Niña, atmosphere/ocean interactions, fronts, cyclones, thunderstorms, lightning, tornadoes, hurricanes, pollutant transport, global climate and atmospheric optics.
CEE 263G	Energy Policy in California (Same as POLISCI 73, PUBLPOL 73)		X	This seminar will provide an in-depth analysis of the role of California state agencies in driving energy policy development, technology innovation, and market structures. The course will cover three areas: 1) roles and responsibilities of key state agencies; 2) current and evolving energy and climate policies; and 3) development of California's 21st century energy systems. Presentations will include experts from the California Energy Commission, the California Public Utilities Commission, the California Air Resources Board, the California Independent System Operator, the California Legislature, and the Governor's office. This class is required for all Stanford Energy Internships in California (SEIC) fellowship awardees and is open to other interested undergraduate and graduate students. Class dates are: April 2nd (10am-2pm), April 30th (10am-1pm), and May 21st (10am-1pm). Lunch will be provided. May be repeat for credit. If interested you can fill out this webform: <a href="http://web.stanford.edu/~sburbank/Energy.fb">http://web.stanford.edu/~sburbank/Energy.fb</a>
CEE 263S	Atmosphere/Energy Seminar		X	Interdisciplinary seminar with talks by researchers and practitioners in the fields of atmospheric science and renewable energy engineering. Addresses the causes of climate, air pollution, and weather problems and methods of addressing these problems through renewable and efficient energy systems. May be repeated for credit.
CEE 265A	Sustainable Water Resources Development		X	Alternative criteria for judging the sustainability of projects. Application of criteria to evaluate sustainability of water resources projects in several countries. Case studies illustrate the role of political, social, economic, and environmental factors in decision making. Influence of international aid agencies and NGOs on water projects. Evaluation of benefit-cost analysis and environmental impact assessment as techniques for enhancing the sustainability of future projects. Limited enrollment
CEE 265D	Water and Sanitation in Developing Countries (Same as CEE 165D)		X	Economic, social, political, and technical aspects of sustainable water supply and sanitation service provision in developing countries. Service pricing, alternative institutional structures including privatization, and the role of consumer demand and community participation in the planning process. Environmental and public health considerations, and strategies for serving low-income households. Limited enrollment. Prerequisite: consent of instructor. <a href="http://seejennadavis.stanford.edu">seejennadavis.stanford.edu</a> for application
CEE 266A	Watersheds and Wetlands (Same as CEE 166A)		X	Introduction to the occurrence and movement of water in the natural environment and its role in creating and maintaining terrestrial, wetland, and aquatic habitat. Hydrologic processes, including precipitation, evaporation, transpiration, snowmelt, infiltration, subsurface flow, runoff, and streamflow. Rivers and lakes, springs and swamps. Emphasis is on observation and measurement, data analysis, modeling, and prediction. Prerequisite: 101B or equivalent. (Freyberg)
CEE 266B	Floods and Droughts, Dams and Aqueducts (Same as CEE 166B)		X	Sociotechnical systems associated with human use of water as a resource and the hazards posed by too much or too little water. Potable and non-potable water use and conservation. Irrigation, hydroelectric power generation, rural and urban water supply systems, storm water management, flood damage mitigation, and water law and institutions. Emphasis is on engineering design. Prerequisite: 166A or equivalent. (Freyberg)
CEE 266D	Water Resources and Water Hazards Field Trips (Same as CEE 166D)		X	Introduction to water use and water hazards via weekly field trips to local and regional water resources facilities (dams, reservoirs, fish ladders and hatcheries, pumping plants, aqueducts, hydropower plants, and irrigation systems) and flood damage mitigation facilities (storm water detention ponds, channel modifications, flood control dams, and reservoirs). Each trip preceded by an orientation lecture.

CEE 268	Groundwater Flow	X		Flow and mass transport in porous media. Applications of potential flow theory and numerical modeling methods to practical groundwater problems: flow to and from wells, rivers, lakes, drainage ditches; flow through and under dams; streamline tracing; capture zones of wells; and mixing schemes for in-situ remediation. Prerequisites: calculus and <u>introductory fluid mechanics.</u>
CEE 270	Movement and Fate of Organic Contaminants in Waters		X	Transport of chemical constituents in surface and groundwater including advection, dispersion, sorption, interphase mass transfer, and transformation; impacts on water quality. Emphasis is on physicochemical processes and the <u>behavior of hazardous waste contaminants.</u>
CEE 270B	Environmental Organic Reaction Chemistry	X		With over 70,000 chemicals now in production worldwide, predicting their fate in the environment is a difficult task. The course focuses on developing two key skills. First, students should develop the ability to derive mass balance equations used to quantify the fate of chemicals in the environment. With so many chemicals having been introduced in the past ~60 years, many of the key parameters needed for mass balance models have not been measured experimentally. The class builds on CEE 270, which developed methods of predicting equilibrium partitioning coefficients. For many situations involving reactions of target contaminants, equilibrium is not attained. The course develops methods of predicting the reactivity of chemicals based upon their chemical structures both qualitatively and quantitatively. natural reaction processes covered include acid-base speciation, nucleophilic substitution, oxidation/reduction reactions, and photochemical reactions. Key treatment reactions (ozone, UV treatment and <u>advanced oxidation</u> ) are also covered. Prerequisites: CEE 270, Chem 31B/X.
CEE 271B	Environmental Biotechnology	X		Stoichiometry, kinetics, and thermodynamics of microbial processes for the transformation of environmental contaminants. Design of dispersed growth and biofilm-based processes. Applications include treatment of municipal <u>and industrial waste waters, detoxification of hazardous chemicals, and groundwater remediation.</u>
CEE 272	Coastal Contaminants		X	Coastal pollution and its effects on ecosystems and human health. The sources, fate, and transport of human pathogens and nutrients. Background on coastal ecosystems and coastal transport phenomena including tides, waves, <u>and cross shelf transport. Introduction to time series analysis with MATLAB.</u>
CEE 272R	Modern Power Systems Engineering	X		Focus is on Power Engineering from a systems point of view. Topics covered may include modeling of generation, transmission and distribution systems, load flow analysis, transient and steady-state stability analysis. Special emphasis given to modern market operations and dispatch, modeling intermittent controllable power sources, storage technologies, mechanisms for demand response, sensing the grid and the role of market mechanisms for deep <u>integration. Course content may vary year to year.</u>
CEE 273	Aquatic Chemistry	X		Chemical principles and their application to the analysis and solution of problems in aqueous geochemistry (temperatures near 25° C and atmospheric pressure). Emphasis is on natural water systems and the solution of specific <u>chemical problems in water purification technology and water pollution control.</u>
CEE 273A	Water Chemistry Laboratory (Same as CEE 179A)	X		(Graduate students register for 273A.) Laboratory application of techniques for the analysis of natural and <u>contaminated waters, emphasizing instrumental techniques</u>
CEE 274P	Environmental Health Microbiology Lab	X		Microbiology skills including culture-, microscope-, and molecular-based detection techniques. Focus is on standard and EPA-approved methods to enumerate and isolate organisms used to assess risk of enteric illnesses, such as coliforms, enterococci, and coliphage, in drinking and recreational waters including lakes, streams, and coastal waters. Student <u>project to assess the microbial water quality of a natural water.</u>
CEE 275K	The Practice of Environmental Consulting	X		Class consists of eight interactive two-hour seminars with discussions, and will cover the evolution of the environmental consulting business, strategic choices and alternative business models for private and public firms, a review of the key operational issues in managing firm, organizational strategies, knowledge management and innovation, and ethical issues in providing professional services. Case studies will be used to illustrate key concepts. Selected reading materials drawn from the technical and business literature on the consulting business. Student groups will prepare and present an abbreviated business plan for an environmental based business. Enrollment limited to CEE <u>MS and PHD students.</u>
CEE 276	Introduction to Human Exposure Analysis (Same as CEE 178)	X		(Graduate students register for 276.) Scientific and engineering issues involved in quantifying human exposure to toxic chemicals in the environment. Pollutant behavior, inhalation exposure, dermal exposure, and assessment tools. Overview of the complexities, uncertainties, and physical, chemical, and biological issues relevant to risk assessment. <u>Lab projects.</u>
CEE 277S	Design for a Sustainable World (Same as CEE 177S)		X	Technology-based problems faced by developing communities worldwide. Student groups partner with organizations abroad to work on concept, feasibility, design, implementation, and evaluation phases of various projects. Past projects include a water and health initiative, a green school design, seismic safety, and medical device. Admission based on written application and interview. See <a href="http://esw.stanford.edu">http://esw.stanford.edu</a> for application. (Staff)
CEE 278A	Air Pollution Fundamentals		X	The sources and health effects of gaseous and particulate air pollutants. The influence of meteorology on pollution: temperature profiles, stability classes, inversion layers, turbulence. Atmospheric diffusion equations, downwind dispersion of emissions from point and line sources. Removal of air pollutants via settling, diffusion, coagulation, precipitation, Mechanisms for ozone formation, in the troposphere versus in the stratosphere. Effects of airborne particle size and composition on light scattering/absorption, and on visual range.
CEE 279A	Environmental Engineering & Science Seminar (Same as CEE 269A)	X		Presentations on current research in environmental engineering and science by Civil & Environmental Engineering <u>faculty.</u>

CEE 279B	Environmental Engineering & Science Seminar (Same as CEE 269B)	X		Presentations on current research, practice and thinking in environmental engineering and science by visiting academics and practitioners.
CEE 279C	Environmental Engineering and Science Seminar (Same as CEE 269C)	X		Presentations on current research, practice and thinking in environmental engineering and science by visiting academics and practitioners
CEE 297M	Managing Critical Infrastructure		X	Safe and effective performance of infrastructure systems is critical to our economy, quality of life and safety. This course will present topics associated with risk analysis and management of critical civil infrastructure systems, tolerable risk and community resilience. Methods of risk analysis including systems analysis, reliability analysis, expert elicitation and systems analysis for spatially distributed infrastructure systems will be presented. Aspects of seismic and flood risk analysis will also be discussed. Case histories and lessons learned from Hurricane Katrina, Tohoku earthquake, among others will be presented. The evolution of change in the risk management of civil infrastructure systems; how they are analyzed, designed and operated is discussed. Guest speakers. Student presentations.
CEE 301	The Energy Seminar (Same as ENERGY 301, MS&E 494)		X	Interdisciplinary exploration of current energy challenges and opportunities, with talks by faculty, visitors, and students.
CEE 323A	Infrastructure Finance and Governance	X		Presentation and discussion of early stage or more mature research on a variety of topics related to financing, governance and sustainability of civil infrastructure projects by researchers associated with the Global Projects Center and visiting speakers. To obtain one unit of credit, students must attend and participate in all seminars, with up to two excused absences. Seminar meets weekly during Autumn, Winter and Spring Quarters.
CEE 323B	Infrastructure Finance and Governance	X		Presentation and discussion of early stage or more mature research on a variety of topics related to financing, governance and sustainability of civil infrastructure projects by researchers associated with the Global Projects Center and visiting speakers. To obtain one unit of credit, students must attend and participate in all seminars, with up to two excused absences. Seminar meets weekly during Autumn, Winter, and Spring quarters.
CEE 323C	Infrastructure Finance and Governance	X		Presentation and discussion of early stage or more mature research on a variety of topics related to financing, governance and sustainability of civil infrastructure projects by researchers associated with the Global Projects Center and visiting speakers. To obtain one unit of credit, students must attend and participate in all seminars, with up to two excused absences. Seminar meets weekly during Autumn, Winter and Spring Quarters.
CEE 324	Industrialized Construction	X		The course will present driving forces, comprehensive concepts, technologies, and managerial aspects of Industrialized Construction. Further a series of case studies of successful and failed industry implementations in Sweden, North America and Japan will be presented, showcasing process and technology platforms; use of renewable resources and other sustainable design and construction practices. The contrast between industrialized construction practices in Sweden, the U.S. and other countries is highlighted. Project-orientated vs. product-oriented approaches are essential, along with business models and strategies for industrialized construction companies and their opportunities for innovations. The course includes lectures, case studies, and course group-project assignments with leading companies in the industry. Visiting lecturer Dr Jerker Lessing, one of Sweden's leading experts on industrialized construction with more than 15 years of experience in this field, is giving this course. This is a unique opportunity to learn about this comprehensive, emerging construction concept. Dr Lessing's research at Lund University has pioneered the area of industrialized construction and established models and strategic perspectives that are widely adopted throughout academia and industry. Dr Lessing has published articles and books and he frequently lectures on the topic in Sweden and internationally. He is the Director and General manager of Research and Development at BoKlok, an industrialized house-building company which is a joint venture of the construction company SKANSKA and furniture giant IKEA. Notes: Attendance Mandatory. No Exam. Case and Problem Discussion. CR/NC and Auditing Not Allowed. Eligible for SDC Building & Infrastructure Development concentration area requirement. Number of students limited to 20; prerequisites: CEE100 or equivalent. To apply, please email resume to jlessing@stanford.edu and complete the following form: <a href="http://goo.gl/forms/guo17lFTcb">http://goo.gl/forms/guo17lFTcb</a>
CEE 363B	Chaos and Turbulence	X		An overview of the statistical analysis of unsteady flows, with a focus on chaos and turbulence. Topics will include random variables and statistical analysis; self-similarity, scaling, and symmetries; the turbulent energy cascade and the Kolmogorov similarity hypotheses; intermittency, refined similarity, and multifractal analysis; mixing and transport in chaotic and turbulent flows; and an overview of the effects of additional conservation laws on flow statistics. Prerequisites: CEE 262A or ME 351A, or permission of instructor.
CEE 374M	Advanced Topics in Watershed Systems Modeling	X		Basic principles of watershed systems analysis is required for water resources evaluation, watershed-scale water quality issues, and watershed-scale pollutant transport problems. The dynamics of watershed-scale processes and the human impact on natural systems, and for developing remediation strategies are studied, including terrain analysis and surface and subsurface characterization procedures and analysis.
CEE 374T	Advanced Topics in Coastal Pollution		X	May be repeated for credit. Prerequisite: consent of instructor.
CEE 374W	Advanced Topics in Water, Health and Development	X		Advanced topics in water, health and development. Emphasis on low-and-middle-income countries. Class content varies according to interests of students. Instructor consent required.

CEE 375A	Water, Climate, and Health		X	Students in this course will review and discuss current literature on the water, climate, and human health nexus. We will review the climate-change projections from the most recent IPCC assessment and discuss their implications for water access and human health, with an emphasis on low- and middle-income countries. Each student will take responsibility for leading at least one class discussion, and will write a research proposal describing novel research on the water, climate and human health nexus. Course enrollment is capped. Permission to enroll must be obtained from the instructors through an application process.
CEE 379	Introduction to PHD Studies in Civil and Environmental Engineering	X		This seminar course will cover important topics for students considering a PhD in Civil and Environmental Engineering. Sessions will include presentations and discussions on career development, exploring research and adviser options, and the mechanics of PhD studies, including General Qualifying Exam requirements for all CEE PHD Students. In addition, CEE faculty will give presentations on their research. This seminar is required for CEE students considering a PHD or preparing to sit for the General Qualifying Exam in Civil and Environmental Engineering.
CEE 277C	Environmental Governance (Same as ENVRES 250)		X	This interdisciplinary course presents an overview of environmental governance through an examination of how and why societies manage the relationships between human beings and the natural world. By comparing regulatory, community-based, and incentive-based environmental management systems, we address why certain environmental problems are managed as they are, and what approaches to environmental management are more (or less) successful. Designed for graduate students and upper-level undergraduates with some exposure to both the natural sciences (ecology/environmental chemistry), and the social sciences (anthropology, economics, political science, or sociology). A pre-course incoming survey is required.
CHEM 10	Exploring Research and Problem Solving Across the Sciences	X		Development and practice of critical problem solving and study skills using wide variety of scientific examples that illustrate the broad yet integrated nature of current research. Student teams will have the opportunity to explore and present on topics revolving around five central issues: energy, climate change, water resources, medicine, and food & nutrition from a chemical perspective. Course offered in August prior to start of fall quarter.
CHEM 25N	Science in the News	X		Preference to freshmen. Possible topics include: diseases such as avian flu, HIV, and malaria; environmental issues such as climate change, atmospheric pollution, and human population; energy sources in the future; evolution; stem cell research; nanotechnology; and drug development. Focus is on the scientific basis for these topics as a basis for intelligent discussion of societal and political implications. Sources include the popular media and scientific media for the nonspecialist, especially those available on the web.
CHEM 28N	Science Innovation and Communication	X		Preference to freshmen. The course will explore evolutionary and revolutionary scientific advances; their consequences to society, biotechnology, and the economy; and mechanisms for communicating science to the public. The course will engage academic and industrial thought leaders and provide an opportunity for students to participate in communicating science to the public.
CHEM 111	Exploring Chemical Research at Stanford	X		Preference to freshmen and sophomores. Department faculty describe their cutting-edge research and its applications.
CHEMENG 10	The Chemical Engineering Profession	X		Open to all undergraduates. Overview of and careers in chemical engineering; opportunities to develop networks with working professionals. Panel discussions on career paths and post-graduation opportunities available. Areas include biotechnology, electronics, energy, environment, management consulting, nanotechnology, and graduate school in business, law, medicine, and engineering.
CHEMENG 31N	When Chemistry Meets Engineering	X		Preference to freshmen. Chemistry and engineering are subjects that are ubiquitous around us. But what happens when the two meet? Students will explore this question by diving into experimental problems that scientists and engineers have to face on a daily basis. Many processes that are taken for granted have been developed by understanding science at a very fundamental level and then applying it to large and important industrial processes. In this seminar, students will explore some of the basic concepts that are important to address chemical engineering problems through experimental work. Students will build materials for energy and environmental applications, understand how to separate mixtures into pure compounds, produce fuels, and will learn to look at the chemical properties of molecules that are part of daily life with a different eye.
CHEMENG 60Q	Environmental Regulation and Policy		X	Preference to sophomores. How environmental policy is formulated in the U.S. How and what type of scientific research is incorporated into decisions. How to determine acceptable risk, the public's right to know of chemical hazards, waste disposal and clean manufacturing, brownfield redevelopment, and new source review regulations. The proper use of science and engineering including media presentation and misrepresentation, public scientific and technical literacy, and emotional reactions. Alternative models to formulation of environmental policy. Political and economic forces, and stakeholder discussions.

CHEMENG 90Q	Dare to Care: Compassionate Design	X		Imagine yourself with your abundant creativity, intellect, and passion, but your ability to move or speak is diminished. How would you face the world, how would you thrive at Stanford, how would you relay to people your ideas and creations? How would you share yourself and your ideas with the world? nThere are more than 50 million individuals in America with at least one disability, and in the current world of design, these differences are often overlooked. How do we as designers empower people of diverse physical abilities and provide them with means of self-expression?nnln Compassionate Design, students from any prospective major are invited to explore the engineering design process by examining the needs of persons with disabilities. Through invited guests, students will have the opportunity to directly engage people with different types of disabilities as a foundation to design products that address problems of motion and mobility, vision, speech and hearing. For example, in class, students will interview people who are deaf, blind, have cerebral palsy, or other disabling conditions. Students will then be asked, using the design tools they have been exposed to as part of the seminar, to create a particular component or device that enhances the quality of life for that user or users with similar limitations.
CHEMENG 120B	Energy and Mass Transport	X		General diffusive transport, heat transport by conduction, Fourier's law, conduction in composites with analogies to electrical circuits, advection-diffusion equations, forced convection, boundary layer heat transport via forced convection in laminar flow, forced convection correlations, free convection, free convection boundary layers, free convection correlations and application to geophysical flows, melting and heat transfer at interfaces, radiation, diffusive transport of mass for dilute and non-dilute transfer, mass and heat transport analogies, mass transport with bulk chemical reaction, mass transport with interfacial chemical reaction, evaporation.
CHEMENG 140	Micro and Nanoscale Fabrication Engineering (Same as CHEMENG 240)	X		Survey of fabrication and processing technologies in industrial sectors, such as semiconductor, biotechnology, and energy. Chemistry and transport of electronic and energy device fabrication. Solid state materials, electronic devices and chemical processes including crystal growth, chemical vapor deposition, etching, oxidation, doping, diffusion, thin film deposition, plasma processing. Micro and nanopatterning involving photolithography, unconventional soft lithography and self assembly.
CHEMENG 142	Basic Principles of Heterogeneous Catalysis with Applications in Energy Transformations (Same as CHEMENG 242)	X		(Formerly 124/224) Introduction to heterogeneous catalysis, including models of surface reactivity, surface equilibria, kinetics of surface reactions, electronic and geometrical effects in heterogeneous catalysis, trends in reactivity, catalyst structure and composition, electro-catalysis and photo-catalysis. Selected applications and challenges in energy transformations will be discussed.
CHEMENG 162	Polymers for Clean Energy and Water (Same as CHEMENG 262)		X	The first five weeks of this course will be devoted to the fundamental aspects of polymers necessary to understand the applications in energy and the environment. These include: polymer chain configuration, morphology of semi-crystalline and amorphous solids, thermal transition behavior, thermodynamics of polymer blends and block copolymers, and the time/temperature dependence of linear viscoelasticity. The remaining five weeks of class will be devoted to applications, with special emphasis on membrane transport, including ion transport in fuel cell exchange membranes, gas transport in hydrogen enrichment membranes, and water transport in desalination membranes. In addition, completely degradable biocomposites will be discussed.
CHEMENG 180	Chemical Engineering Plant Design	X		Open to seniors in chemical engineering or by consent of instructor. Application of chemical engineering principles to the design of practical plants for the manufacture of chemicals and related materials. Topics: flow-sheet development from a conceptual design, equipment design for distillation, chemical reactions, heat transfer, pumping, and compression; estimation of capital expenditures and production costs; plant construction.
CHEMENG 191H	Undergraduate Honors Seminar	X		For Chemical Engineering majors approved for B.S. with Honors research program. Honors research proposal must be submitted and unofficial transcript document BSH status prior to required concurrent registration in 190H and 191H. May be repeated for credit. Corequisite: 190H
CHEMENG 274	Environmental Microbiology I (Same as CEE 274A, CHEMENG 174)	X		Basics of microbiology and biochemistry. The biochemical and biophysical principles of biochemical reactions, energetics, and mechanisms of energy conservation. Diversity of microbial catabolism, flow of organic matter in nature: the carbon cycle, and biogeochemical cycles. Bacterial physiology, phylogeny, and the ecology of microbes in soil and marine sediments, bacterial adhesion, and biofilm formation. Microbes in the degradation of pollutants.
CHEMENG 296	Creating New Ventures in Engineering and Science-based Industries (Same as CHEMENG 196, CHEM 196, CHEM 296)	X		Open to seniors and graduate students interested in the creation of new ventures and entrepreneurship in engineering and science intensive industries such as chemical, energy, materials, bioengineering, environmental, clean-tech, pharmaceuticals, medical, and biotechnology. Exploration of the dynamics, complexity, and challenges that define creating new ventures, particularly in industries that require long development times, large investments, integration across a wide range of technical and non-technical disciplines, and the creation and protection of intellectual property. Covers business basics, opportunity viability, creating start-ups, entrepreneurial leadership, and entrepreneurship as a career. Teaching methods include lectures, case studies, guest speakers, and individual and team projects.
CHEMENG 432	Electrochemical Energy Conversion	X		Electrochemistry is playing an increasingly important role in renewable energy. This course aims to cover the fundamentals of electrochemistry, and then build on that knowledge to cover applications of electrochemistry in energy conversion. Topics to be covered include fuel cells, solar water-splitting, CO2 conversion to fuels and chemicals, batteries, redox flow cells, and supercapacitors.

CHEMENG 456	Microbial Bioenergy Systems (Same as CEE 274B)	X		Introduction to microbial metabolic pathways and to the pathway logic with a special focus on microbial bioenergy systems. The first part of the course emphasizes the metabolic and biochemical principles of pathways, whereas the second part is more specifically directed toward using this knowledge to understand existing systems and to design innovative microbial bioenergy systems for biofuel, biorefinery, and environmental applications. There also is an emphasis on the implications of rerouting of energy and reducing equivalents for the fitness and ecology of the organism.
CHPR 130	Human Nutrition (Same as HUMBIO 130)	X		The study of food, and the nutrients and substances therein. Their action, interaction, and balance in relation to health and disease. Emphasis is on the biological, chemical, and physiological processes by which humans ingest, digest, absorb, transport, utilize, and excrete food. Dietary composition and individual choices are discussed in relationship to the food supply, and to population and cultural, race, ethnic, religious, and social economic diversity. The relationships between nutrition and disease; ethnic diets; vegetarianism; nutritional deficiencies; nutritional supplementation; phytochemicals.
CHPR 206	Meta-research: Appraising Research Findings, Bias, and Meta-analysis (Same as STATS 211, MED 206, HRP 206)	X		Open to graduate, medical, and undergraduate students. Appraisal of the quality and credibility of research findings; evaluation of sources of bias. Meta-analysis as a quantitative (statistical) method for combining results of independent studies. Examples from medicine, epidemiology, genomics, ecology, social/behavioral sciences, education. Collaborative analyses. Project involving generation of a meta-research project or reworking and evaluation of an existing published meta-analysis. Prerequisite: knowledge of basic statistics.
CHPR 226	Promoting Health Over the Life Course: Multidisciplinary Perspectives (Same as HUMBIO 126)	X		Disease prevention and health promotion topics pertinent to different stages of the life span emphasizing healthy lifestyle and reducing risk factors in both individuals and communities. Focus is on scientific investigation, the application of behavioral science to risk reduction strategies, and the importance of health promotion as a social and economic imperative. Topics include: epidemiology of chronic diseases; social determinants of health, behavior change; obesity, nutrition, and stress; children, young adult, mid-life and aging health issues; health care delivery and public health system; workplace wellness programs; and other additional issues. Students enrolled in CHPR 226 must complete additional assignments appropriate for its Masters level listing.
CHPR 228	Theoretical Foundations and Design of Behavioral Intervention Trials	X		Focuses on the knowledge and skills, respect and thoughtful practice of designing health promotion interventions that are relevant, theoretically-informed, have broad impacts, and can endure. Provides an in-depth review of intervention approaches for health promotion and disease prevention and covers the leading theories of behavior change. Follows an integrative model to demonstrate similarities and differences between the theoretical approaches, seeking what is useful and worthwhile in each theoretical model rather than looking primarily for what is most easily criticized. Practical in nature with emphasis on the specifics of needs assessments and intervention development and delivery and how these may vary across community settings, with diverse populations, addressing different behaviors, and leveraging traditional and emerging delivery channels. Explores intervention creation, delivery, effectiveness, and sustainability to identify and better understand the resources and other practical considerations necessary to produce, deliver, monitor, and disseminate an intervention with demonstrated effectiveness. Examples drawn from across the behavioral spectrum and include tobacco control, physical activity, healthy diet, stress and distress, as well as consideration of the complexities of extending interventions to target multiple risk behaviors. Students develop a foundational understanding of behavior change theory, rigorous research methods, and creative design strategies to advance the health of individuals and communities.
CHPR 291	Assessing the Health Effects of Economic Change	X		This practicum will involve students as managers of real-time study of the health effects of minimum wage changes in the Bay Area. A long-held economic theory suggests that increased income should have secondary benefits to health, particularly for mental health and adverse health behaviors (e.g., binge drinking). Recent increases in the minimum wage in the Bay Area provide a rare opportunity to test this theory. Students in this course will participate in organizing, executing and directing a community-based study of the health effects of minimum wage increases among local cities, under close guidance and supervision of Stanford faculty in medicine, health economics and sociology. Students will engage in class meetings one hour per week to learn classical and novel methods for the analysis of natural experiments in health policy and economics (e.g., different-in-differences methods, synthetic control analysis), and are expected to participate in directed field-based group projects for several additional hours per week. Priority will be given to students with interest and experience in community-based research on social determinants of health and with bilingual English/Spanish speaking skills. Prerequisites: A course in statistics. Students will be expected to travel off campus to area of Santa Clara and San Mateo counties accessible via Marguerite shuttle, BART/Caltrain or VTA bus. The group work involves recruiting and surveying low-income community members, and requires tenacity to conduct field-based studies.
CLASSICS 121	Ecology in Philosophy and Literature	X		The basic principles of ecological thinking, exploring the ways that different writers represent and relate to the natural world. Some key questions: What is nature, and where do humans fit in the natural world? How exactly do humans differ from other animals? Do these differences make us superior beings? What are our ethical responsibilities towards the earth and its inhabitants? In what ways have the technologies of writing, television, and computers affected humankind's relationship to the natural world?

CLASSICS 156	Design of Cities (Same as ARCHGLY 156)	X		Long-term, comparative and archaeological view of urban planning and design. Cities are the fastest changing components of the human landscape and are challenging our relationships with nature. They are the historical loci of innovation and change, are cultural hotspots, and present a tremendous challenge through growth, industrial development, the consumption of goods and materials. We will unpack such topics by tracking the genealogy of qualities of life in the ancient Near Eastern city states and those of Graeco-Roman antiquity, with reference also to prehistoric built environments and cities in the Indus Valley and through the Americas. The class takes an explicitly human-centered view of urban design and one that emphasizes long term processes.
COMPLIT 27Q	You Are Here: Writing in the Age of Environmental Crisis		X	How have writers responded to a growing sense of environmental crisis? How do various literary genres and forms help writers convey a sense of urgency, evoke feelings of loss, or prompt a call to action? Students will encounter recent stories, songs, memoirs, essays, and poems by writers from around the world that engage with the relationship between humans and our precarious environment. Texts such as Cormac McCarthy's post-apocalyptic novel <i>The Road</i> , Inger Christensen's long poem <i>alphabet</i> , and Arundati Roy's fable <i>The Briefing</i> will allow us to see how race, class, and region impact experiences and depictions of a planet in crisis. These texts will also model options for students' own creative writing on nature, place, and crisis across genres. Assignments will include observational writing, experiments with genre shifts, and research and writing on the places we call home as members of a global community.
COMPLIT 70N	Animal Planet and the Romance of the Species (Same as CHINA 70N)	X		Preference to freshmen. This course considers a variety of animal characters in Chinese and Western literatures as potent symbols of cultural values and dynamic sites of ethical reasoning. What does pervasive animal imagery tell us about how we relate to the world and our neighbors? How do animals define the frontiers of humanity and mediate notions of civilization and culture? How do culture, institutions, and political economy shape concepts of human rights and animal welfare? And, above all, what does it mean to be human in the pluralistic and planetary 21st century?
COMPLIT 229	Literature and Global Health (Same as FRENCH 229, HUMBIO 175L, CSRE 129B, AFRICAAM 229, AFRICAST 229, MED 234)	X		This course examines the ways writers in literature and medicine have used the narrative form to explore the ethics of care in what has been called the developing world. We will begin with a call made by the editor-in-chief of <i>The Lancet</i> for a literature of global health, namely fiction modeled on the social reform novels of the nineteenth century, understood to have helped readers develop a conscience for public health as the field emerged as a modern medical specialty. We will then spend the quarter understanding how colonial, postcolonial, and world literatures have answered and complicated this call. Readings will include prose fiction by Albert Camus, Joseph Conrad, Tsitsi Dangaremba, Amitav Ghosh, Susan Sontag as well as physician memoirs featuring Frantz Fanon, Albert Schweitzer, Abraham Verghese, Paul Farmer. And each literary reading will be paired with medical, philosophical, and policy writings that deeply inform the field of global health.
COMPLIT 371	Aesthetics, Politics, and Modernity: Critical Theory and China (Same as CHINA 371)	X		This course explores a number of key motifs of critical theory relevant to Chinese studies. The class will focus on theories of modernity, media, literature, film, and the relation of aesthetics and politics. The prevalent view believes that a radical politics can be articulated aesthetically by unleashing sensual pleasure, forging subjectivity or staging performance. This view is at risk of reducing the political potential of artworks to spectacle, commodity, and consumption. By re-examining major pronouncements about artworks, culture and politics, we will explore the ways aesthetics and politics are intertwined, break apart, and re-configured. Our discussion will explore the potential of aesthetics and politics as analytical categories for understanding literature, culture, power, morality, media, and history. We will read works from the Chinese classics and representative theorists. We will also read critical theories by Walter Benjamin, Althusser, Eagleton, and Buck-Morss. In each class students should be ready to raise at least one question and explain the origin of the question, or make a brief comment on readings. I will randomly ask students to respond and this performance is graded. The final work will be a digestion and synthesis (18-22 pages) of a set of questions or motifs from 3 writers. Students may have an option of writing a research paper working the concepts into the analysis of primary texts.
COMP MED 202	Training in Research and Biomethodology for Laboratory Animal Science	X		Emphasis is on providing introductory training and practical, hands-on workshops for students interested in learning more about research biomethodology and animal models of human and animal disease. Topics include basic care and principals guiding the use of research animals, animal health and welfare, and research animal enrichment, basic mouse handling, rodent breeding, and the principals of rodent surgery and anesthesia. Content delivered online and in-person.
CS 22A	The Social & Economic Impact of Artificial Intelligence	X		Recent advances in computing may place us at the threshold of a unique turning point in human history. Soon we are likely to entrust management of our environment, economy, security, infrastructure, food production, healthcare, and to a large degree even our personal activities, to artificially intelligent computer systems. The prospect of "turning over the keys" to increasingly autonomous systems raises many complex and troubling questions. How will society respond as versatile robots and machine-learning systems displace an ever-expanding spectrum of blue- and white-collar workers? Will the benefits of this technological revolution be broadly distributed or accrue to a lucky few? How can we ensure that these systems respect our ethical principles when they make decisions at speeds and for rationales that exceed our ability to comprehend? What, if any, legal rights and responsibilities should we grant them? And should we regard them merely as sophisticated tools or as a newly emerging form of life? The goal of CS22 is to equip students with the intellectual tools, ethical foundation, and psychological framework to successfully navigate the coming age of intelligent machines.

CS 50	Using Tech for Good	X		Students in the class will work in small teams to implement high-impact projects for partner organizations. Taught by the CS+Social Good team, the aim of the class is to empower you to leverage technology for social good by inspiring action, facilitating collaboration, and forging pathways towards global change. Recommended: CS 106B, CS 42 or 142. <u>Class is open to students of all years. May be repeat for credit</u>
CS 51	CS + Social Good Studio: Building Social Impact Projects for Change	X		Get real-world experience launching and developing your own social impact projects! Students will work in small teams to develop high-impact projects around problem domains provided by partner organizations, under the guidance and support of design/technical coaches from industry and nonprofit domain experts. The class aims to provide an outlet, along with the resources, for students to create social change through CS, while providing students with experience engaging in the full product development cycle on real-world projects.
CS 52	CS + Social Good: Implementing Sustainable Social Impact Projects	X		Continuation of CS51 (Building Social Impact Projects for Change). Teams enter the quarter having completed and tested a minimal viable product (MVP) with a well-defined target user, and a community partner. Students will learn to apply scalable technical frameworks, methods to measure social impact, tools for deployment, user acquisition techniques and growth/exit strategies. The purpose of the class is to facilitate students to build a sustainable infrastructure around their product idea. CS52 will host mentors, guest speakers and industry experts for various workshops and coaching-sessions. The class culminates in a showcase where students share their projects with <del>stakeholders and the public</del>
CS 106S	Programming Abstractions and Social Good	X		Supplemental lab to CS 106B and CS 106X. Students will apply fundamental computer science concepts learned in 106B/X to problems in the social good space (such as health, government, education, and environment). Course consists of in-class activities designed by local tech companies and nonprofits. Corequisite: 106B or 106X.
CS 131	Computer Vision: Foundations and Applications	X		<del>Robots that can navigate space and perform routes, search engines that can index opinions or images and videos,</del> algorithms that can diagnose medical images for diseases, or smart cars that can see and drive safely: Lying in the heart of these modern AI applications are computer vision technologies that can perceive, understand and reconstruct the complex visual world. This course is designed for students who are interested in learning about the fundamental principles and important applications of computer vision. Course will introduce a number of fundamental concepts in computer vision and expose students to a number of real-world applications, plus guide students through a series of well designed projects such that they will get to implement cutting-edge computer vision algorithms. Prerequisites: Students should be familiar with Matlab (i.e. have programmed in Matlab before) and Linux; plus Calculus & Linear <del>Algebra</del>
CS 181	Computers, Ethics, and Public Policy	X		Primarily for majors entering computer-related fields. Ethical and social issues related to the development and use of computer technology. Ethical theory, and social, political, and legal considerations. Scenarios in problem areas: privacy, reliability and risks of complex systems, and responsibility of professionals for applications and consequences of their <del>work.</del>
CS 181W	Computers, Ethics, and Public Policy (WIM)	X		Writing-intensive version of CS181. Satisfies the WIM requirement for Computer Science, Engineering Physics, STS, and <del>Math/Comp Sci undergraduates.</del>
CS 377E	Designing Solutions to Global Grand Challenges	X		In this course we creatively apply information technologies to collectively attack Global Grand Challenges (e.g., global warming, rising healthcare costs and declining access, and ensuring quality education for all). This quarter we will focus on assisting refugees. Interdisciplinary student teams will carry out need-finding within a target domain, followed by brainstorming to propose a quarter long project. Teams will spend the rest of the quarter applying user-centered design methods to rapidly iterate through design, prototyping, and testing of their solutions. This course will interweave a weekly lecture with a weekly studio session where students apply the techniques hands-on in a small- <del>scale, supportive environment</del>
CSRE 12	Presidential Politics: Race, Gender, and Inequality in the 2016 Election (Same as AFRICAAM 12, POLISCI 74, CSRE 112, POLISCI 123A, AFRICAAM 109)	X		From the 2016 nomination process to the election. The complexities of identity and its role in uniting and dividing the electorate. Panels covering the media, political participation, and group affiliation.
CSRE 29SI	Migration is Beautiful: Histories, Realities, and Policies of Immigrant Justice	X		We will begin the course by analyzing the history of immigration politics and policy in the United States. How did immigrants fit into and complicate the constructed racial hierarchy throughout history? What characterized the waves of migration to the United States? How have undocumented been marginalized, and what are the ways in which the community responded? In looking at this history, we will learn about the effects it has had on the immigrant community as it relates to the long-lasting disparate impacts in education, criminal justice, and political representation. Immigrants make up a profoundly diverse community that is often mischaracterized. We will discuss the varying perceptions of immigrants today and how they impact attitudes and current policies. Although the course and the trip are designed with a focus on national immigration policy, we will also spend some time in this course narrowing in and <del>using the Bay Area as a case study</del>
CSRE 47Q	Heartfulness: Mindfulness, Compassion, and Responsibility	X		We practice mindfulness as a way of enhancing well-being, interacting compassionately with others, and engaging in socially responsible actions as global citizens. Contemplation is integrated with social justice through embodied practice, experiential learning, and creative expression. Class activities and assignments include journaling, mindfulness practices, and expressive arts. We build a sense of community through appreciative intelligence, connected knowing, <del>deep listening and storytelling.</del>

CSRE 99	Housing Justice Research Lab (Same as URBANST 187)	X		In this course, students will contribute to ongoing community-based research projects focused on housing justice in the Bay Area. Students will work directly with local community organizations working in advocacy, legal aid, and community research. Projects may include interviews, historical research, surveys, case studies, participant observation, media analysis, and writing op-eds. Students will have the opportunity to select from research projects developed by the community partners and instructors. Students that want to engage in an alternative project should consult with the instructors. Students are encouraged to enroll for multiple quarters to develop more substantial projects and deeper relationships with community partners.
CSRE 100B	Grassroots Community Organizing Field Work	X		Continuation of projects and community engagement from CSRE 100. Prerequisite: completion of CSRE 100.
CSRE 109A	Federal Indian Law (Same as NATIVEAM 109A)		X	Cases, legislation, comparative justice models, and historical and cultural material. The interlocking relationships of tribal, federal, and state governments. Emphasis is on economic development, religious freedom, and environmental justice issues in Indian country.
CSRE 115	Race and Human Rights (Same as COMPLIT 105)	X		The recent elections in the United States, the BREXIT vote, and the rightward movement in many European nation states all may be taken as indexes to the ways race plays a central role in politics. Race and ethnicity show up in policies over immigration, refugees, citizenship, policing, incarceration, and other topics and issues. This all puts tremendous pressure on human rights discourse. The foundational document of modern human rights is the 1948 Universal Declaration of Human Rights, drafted at a time when the newly-established United Nations recognized the need for rights for a new post-war, and increasingly post-colonial world. Our course will study the basis of human rights historically and philosophically with particular attention to the relation between human rights and anti-racist work. What are the possibilities and challenges? A unique and exciting part of the course is that it is an international collaboration with classes at the University of Wurzburg, Germany, and the University of California at Merced. Using the Stanford-based TeachingHumanRights.org website, we will create a three-campus project that puts students and instructors together as an international community of scholar-activists.
CSRE 120F	Buying Black: Economic Sovereignty, Race, and Entrepreneurship in the USA (Same as AFRICAAM 120F, ANTHRO 120F)	X		This seminar examines how communities of color have critiqued and transformed capitalism in America through concepts of economic independence, entrepreneurship, and sovereignty. By tracing concepts such as the double-duty dollar, casino/tribal capitalisms, retail boycotts, and buying black, the course traces ethnic entrepreneurialism in America. Students will also consider the international context of such US-based movements, particularly in relation to American imperialism and global supply-chain capitalism.
CSRE 165	Identity and Academic Achievement (Same as AFRICAAM 165, VPTL 165)	X		How do social identities affect how people experience academic interactions? How can learning environments be better structured to support the success of all students? In this class, we will explore how a variety of identities such as race, gender, social class, and athletic participation can affect academic achievement, with the goal of identifying concrete strategies to make learning environments at Stanford and similar universities more inclusive. Readings will draw from psychology, sociology, education, and popular press. This class is a seminar format.
CSRE 180E	Introduction to Chicana/Latina Studies (Same as CHILATST 180E)	X		This course draws on intersectional and interdisciplinary approaches to introduce students to the range of issues, experiences, and methodologies that form the foundation of Latina/o/x studies. By considering the relationship between the creation of 'Latinx' and 'American' identities, students will critically reconsider the borders that constitute the U.S. as a political and cultural formation. The course balances depth and breadth in its study of the variety of perspectives and experiences that come to be associated with U.S. Latinxs. Thus, we will analyze the histories of predominant U.S. Latinx sub-groups, such as Mexicans/Chicanxs and Puerto Ricans, while also incorporating considerations of the ways in which broader populations with ties to Central America, South America, and the Caribbean play crucial roles in constituting U.S. Latinx identities. Topics include the U.S./Mexico border and the borderlands; (im)migration and diaspora; literary and cultural traditions; music and expressive practices; labor and structural inequality; social movements; Latinx urbanism; gender and sexuality; political and economic shifts; and inter- and intra-group relations. Sources include a range of social science and humanities scholarship.
CSRE 181	Multicultural Issues in Higher Education (Same as EDUC 381, EDUC 181)	X		The primary social, educational, and political issues that have surfaced in American higher education due to the rapid demographic changes occurring since the early 80s. Research efforts and the policy debates include multicultural communities, the campus racial climate, and student development; affirmative action in college admissions; multiculturalism and the curriculum; and multiculturalism and scholarship.
CSRE 198	Internship for Public Service (Same as CHILATST 198)	X		Students should consult with CCSRE Director of Community Engaged Learning (ddmurray@stanford.edu) to develop or sign-up for a community service internship. Group meetings may be required. May be repeated for credit. Service Learning Course (certified by Haas Center).
CSRE 201	Introduction to Public History and Public Service (Same as HISTORY 201, AFRICAAM 102)	X		The dynamic basis of oceanography. Topics: physical environment; conservation equations for salt, heat, and momentum; geostrophic flows; wind-driven flows; the Gulf Stream; equatorial dynamics and ENSO; thermohaline circulation of the deep oceans; and tides. Prerequisite: PHYSICS 41 (formerly 53).

CSRE 201B	Making Meaning: Art, Culture & Social Change (Same as CHILATST 201B)	X		Are you an artist seeking a greater purpose for you art? Would you like to gain a sense of history and best practices for engaging your community in creative work? Practice of and an awareness of the concerns relevant to public art did not begin with Serra's Tilted Arc in 1980s. In contrast to the concerns of public art projects in the western practice of public art as extensions of the museum, this course explores the creative expression that emanates from community and cultural tradition. In communities around the world publicly engaged art making has flourished through creative tradition and collective engagements in social life. These traditions fostered creative works as collective practice, democratic participation, and interventionist impulses. From Agosto Boals's Theater of the Oppressed, to El Teatro Campesino's Farmworker actos to the Free Southern Theater to the Fandangos of southern Veracruz, to muralism of Los Tres Grandes, and the SNCC Freedom Singers, this course links the history of community cultural expression of peoples around the globe as a means to expand contemporary concerns of public and socially engaged art beyond a strictly postmodern art context.
DLCL 53	Designing a Life in the Humanities: History, Literature, Print, Art, Film, Community, and Service	X		This short intensive seminar features Humanities Scholar & Artist in Residence, Clare Whistler, (visiting from England, April 13-27,) will meet for dialogue, workshop, and, for those interested, performance. In order to design a life that integrates meaning and purpose through the Humanities, it is helpful to think in terms of projects, research, collaborations, explorations, locations, and relationships. In five residence based sessions, students will discover personal and professional practices to design and support a life in the humanities, including practical matters: grant proposal writing, gaining non-profit status, creating a Humanities "start up," as well as partnering with investors, foundations, fundraisers, patrons, and community. This course will be of interest to students who would like to maintain the values of the humanities, make a decent living, find good mentors and collaborators, and give back to the community.
DLCL 354A	DLCL Film Series: Migration (Same as DLCL 152A)	X		Join us this quarter for our exploration of the theme "Migration," which will look at the representation of displaced and nomadic bodies in international film. Please be aware that some films may include graphic or disturbing content. Viewers are advised to familiarize themselves with the films' content before viewing. Descriptions of the films can be found at <a href="https://dlcl.stanford.edu/content/dlcl-film-series-spring-2017-migration">https://dlcl.stanford.edu/content/dlcl-film-series-spring-2017-migration</a> . All screenings are free and open to the public and audience members are encouraged to participate in the discussions following the films. Please also note that grades for this course are entirely dependent on attendance, which is taken at the end of each screening.
EARTH 1A	Know Your Planet: Research Frontiers	X		Planet Earth is our only home and so it is critical that we understand how it works, from large-scale geologic processes that shape our continents, to biological processes that produce the air we breathe, to the origins of the energy sources we rely on, to the impacts of the human societies we have created. This course provides an introduction to the cutting edge research of Stanford Earth faculty, who are leading the effort to ask and answers these critical questions about our planet.
EARTH 1B	Know Your Planet: Big Earth	X		Interested in Big Data and how to apply it to global environmental and sustainability challenges? This course provides an introduction to Big Data and its applications in solving global challenges such as meeting global energy needs, food and water security, climate change, and natural hazards. The first half of the course will focus on foundational concepts of Big Data; the second half of the course will focus on applications of Big Data while introducing students to Stanford Earth alumni who are currently using these concepts in their work.
EARTH 1C	Know Your Planet: Science Outside	X		One of the most important ways to learn about the world is to go out and explore it. Over the course of two day-long field trips during the weekend of May 13 & 14, students will learn and implement hands-on skills for conducting research "in the field," that is, outdoors in the natural environment. No previous field-work experience necessary. By focusing on the local geology, geomorphology, soils, ecology, and marine biology surrounding the Stanford campus, we will use careful observation, standard methods for data collecting, and analytical tools to answer fundamental questions about earth and ecosystem function. Along the way, we will also practice basic skills, from hiking to critical thinking, essential for conducting science outside of the controlled environment of the lab. This class is all about learning by doing, so be prepared to get your hands dirty and your feet wet while enjoying the sunshine and fresh air. In addition to the field weekend (May 13/14), this class also includes three mandatory evening meetings: a planning meeting (April 12), an overview and logistics meeting (May 10), and a report-out post-meeting (May 24).
EARTH 2	CLIMATE AND SOCIETY		X	How and why is the climate changing? How might a changing climate affect human society? And what can we do to alter the course of climate change and adapt to any climatic changes that do occur? This course provides an introduction to the natural science and social science of climate change. The focus is on what science tells us about the causes, consequences, and solutions to climate change, as well as on how scientific progress is made on these issues.
EARTH 5	Geokids: Earth Sciences Education		X	Service learning through the Geokids program. Eight weeks of supervised teaching to early elementary students about Earth sciences. Hands-on teaching strategies for science standards-based instruction.

EARTH 10	Losing California: Design in the age of Climate Change		X	How will climate change impact the iconic view from the Golden Gate Bridge in 2025, 2050, 2100? Does an emotional attachment to a place motivate meaningful change to preserve it? How can visual or audio stories diminish the spatial and temporal remoteness of global change? During our weekend course we will learn about the science of global change and the ways in which the view from the Golden Gate Bridge may look dramatically different in the future as a result of changing temperatures and rainfall patterns, rising sea levels, shifts in flora and fauna, and decisions about the built environment. The course will consist of a weekend activity based at the Golden Gate Bridge on April 8 and 9th, followed by two follow-up meetings on campus on April 14 and April 28th. The course will be co-taught by faculty from the School of Earth, Energy and Environmental Sciences and the d.school.
EARTH 100	Research Preparation for Undergraduates		X	For undergraduates planning to conduct research during the summer with faculty in the School of Earth Sciences. Readings, oral presentations, proposal development. May be repeated for credit.
EARTH 126Y	Hard Earth: Stanford Graduate-Student Talks Exploring Tough Environmental Dilemmas (Same as CEE 126Y)		X	Stanford's graduate students are a trove of knowledge -- and, just as important, curiosity -- about environmental sustainability. This seminar will feature talks by graduate students that explore the biggest, most bedeviling questions about environmental sustainability locally and around the world. The course will be structured as follows: every other week, we will hear hour-long graduate student talks about sustainability questions and their research, and on the off weeks, we will discuss the unanswered, debatable questions that relate to the previous week's talk.
EARTH 191	Stanford EARTH Field Courses (Same as GS 191)	X		Four- to seven-day field trips to locations of geologic and environmental interest. Includes trips offered during Thanksgiving and Spring breaks. May be repeated for credit.
EARTH 193	Natural Perspectives: Geology, Environment, and Art		X	Multi-day field trip that combines exploration of regional geology, ecology, and environmental history with guided drawing exercises. We'll visit several sites of geologic and environmental interest, discuss their formation and significance, and use drawing as tool for close observation. Students will gain an understanding of the natural processes shaping California, acquire new skills and techniques for artistic expression, and gain an appreciation for how scientific and aesthetic perspectives complement and enhance one another in the study of nature. No previous scientific or artistic experience is required.
EARTH 251	Negotiation (Same as CEE 151, CEE 251)	X		Students learn to prepare for and conduct negotiations in a variety of arenas including getting a job, managing workplace conflict, negotiating transactions, and managing personal relationships. Interactive class. The internationally travelled instructor who has mediated cases in over 75 countries will require students to negotiate real life case studies and discuss their results in class.
EARTH 280	Pursuing Sustainability: Managing Complex Social Environmental Systems		X	This course provides a systems framework for understanding and managing social-environmental systems, with the ultimate goal of intergenerational well-being. It explores the role of natural, human, social, technological and knowledge capital assets in determining sustainability, and their trade-offs, feedbacks, non-linearities and other interactions within complex systems. Through case study analyses, the course illustrates why complex systems approaches are important and some of the failures that occur without them, and provides an overview of the tools, approaches, and strategies that assist with management of assets for sustainability goals. The course draws on readings from a variety of on-line sources as well as chapters and case studies provided in the required text. Consent of instructor required.
EARTH 281	Case Studies in Leading Change for Sustainability		X	This course focuses on the practice of leading change for sustainability. Students learn mindsets, knowledge, and tools that enable them to develop their capacities and identities as change-makers in advancing intergenerational well-being. The course draws upon conceptual frameworks, case studies, hands-on exercises, class discussion and interactions with transformative leaders to deepen understanding of and capacity to influence decision-making, design strategy, engage partners, and foster transformative change and innovation across scales from self to complex systems. Readings include scholarly articles, business school case material, book chapters and cutting-edge tools developed by organizations that are leading change for sustainability.
EARTH 284	Design Thinking for Sustainable Impact		X	Design Thinking is an exceptionally versatile methodology that combines creativity, human centeredness, design skills, critical thinking, and hands-on building of solutions as an approach to rapidly tackle ill-defined challenges. This boot-camp class immerses students in the cognitive modes, theory, skill-sets, mind-sets, and tools associated with Design Thinking to solve real world challenges aimed at sustainable impact. This project based class gives students an immersive experience in theory, tools, and practice of design thinking in the context of sustainability challenges.
EARTHSYS 9	Public Service Internship Preparation (Same as EDUC 9, URBANST 101, HUMBIO 9, PUBLPOL 74, ARTSINST 40)		X	Are you prepared for your internship this summer? This workshop series will help you make the most of your internship experience by setting learning goals in advance; negotiating and communicating clear roles and expectations; preparing for a professional role in a non-profit, government, or community setting; and reflecting with successful interns and community partners on how to prepare sufficiently ahead of time. You will read, discuss, and hear from guest speakers, as well as develop a learning plan specific to your summer or academic year internship placement. This course is primarily designed for students who have already identified an internship for summer or a later quarter. You are welcome to attend any and all workshops, but must attend the entire series and do the assignments for 1 unit of credit.

EARTHSYS 10	Introduction to Earth Systems		X	For non-majors and prospective Earth Systems majors. Multidisciplinary approach using the principles of geology, biology, engineering, and economics to describe how the Earth operates as an interconnected, integrated system. Goal is to understand global change on all time scales. Focus is on sciences, technological principles, and sociopolitical approaches applied to solid earth, oceans, water, energy, and food and population. Case studies: environmental degradation, loss of biodiversity, and resource sustainability.
EARTHSYS 11	Introduction to Geology (Same as GS 1)	X		Lectures, hands-on laboratories, in-class activities, and one field trip. Focus is on the physical and chemical processes of heat and mass transfer within the earth and its fluid envelopes, including deep-earth, crustal, surface, and atmospheric processes. Topics include plate tectonics, the cycling and formation of different types of rocks, and how geologists use rocks to understand Earth's history.
EARTHSYS 15	Gender, Land Rights, and Climate Change: An International Perspective		X	For decades, numerous and far-reaching consequences of anthropogenic climate change have disproportionately affected women, from poverty, to land rights, to education, to food security, and everything in between. As a result, mitigating climate change has massive implications for women's rights worldwide, and yet, few national or international policies address this critical and worsening intersection. This weekly seminar will examine in depth the relationship between gender and climate change, with a particular focus on land rights, resource use, and international policy in the era of the Sustainable Development Goals and the Paris Agreement. The course will feature guest speakers, reading discussions, and tools to persuasively communicate about gender and climate change.
EARTHSYS 20	The Cuisine of Change: Promoting Child Health and Combating Food Insecurity	X		ASB Course. The course on nutrition, health and food insecurity is split into four projects: 1) Workshop a Story, in which students craft a personal narrative with input from the class, 2) Pose a Question, in which students in pairs attempt to educate the class on many sides of the same issue, 3) Create a Dish, in which students develop original dishes in support of local organizations, and 4) Teach a Class, in which students, in teams, develop a curriculum to be implemented in over the spring break trip. Furthermore, each section will expand the scope of the issue from the individual to the community and all the way up to national policies. The course will be a mix of some of the best lecturers and professors that we've encountered in our time at Stanford as well as a smattering of community challenges. Come with a willingness to push your comfort zone, as some of the activities include creative presentations, taking a no added sugar challenge, get vulnerable, and developing an intelligent attitude toward healthy eating.
EARTHSYS 30	Ecology for Everyone (Same as BIO 30)		X	Everything is connected, but how? Ecology is the science of interactions and the changes they generate. This project-based course links individual behavior, population growth, species interactions, and ecosystem function. Introduction to measurement, observation, experimental design and hypothesis testing in field projects, mostly done in groups. The goal is to learn to think analytically about everyday ecological processes involving bacteria, fungi, plants, animals and humans. The course uses basic statistics to analyze data; there are no math prerequisites except arithmetic. Open to everyone, including those who may be headed for more advanced courses in ecology and environmental science.
EARTHSYS 36N	Life at the Extremes: From the Deep Sea to Deep Space	X		Preference to freshmen. Microbial life is diverse and resilient on Earth; could it survive elsewhere in our solar system? This seminar will investigate the diversity of microbial life on earth, with an emphasis on extremophiles, and consider the potential for microbial life to exist and persist in extraterrestrial locales. Topics include microbial phylogenetic and physiological diversity, biochemical adaptations of extremophiles, ecology of extreme habitats, and apparent requirements and limits of life. Format includes lectures, discussions, lab-based activities and local field trips. Basics of microbiology, biochemistry, and astrobiology.
EARTHSYS 41N	The Global Warming Paradox		X	Preference to freshman. Focus is on the complex climate challenges posed by the substantial benefits of energy consumption, including the critical tension between the enormous global demand for increased human well-being and the negative climate consequences of large-scale emissions of carbon dioxide. Topics include: Earth's energy balance; detection and attribution of climate change; the climate response to enhanced greenhouse forcing; impacts of climate change on natural and human systems; and proposed methods for curbing further climate change. Sources include peer reviewed scientific papers, current research results, and portrayal of scientific findings by the mass media and social networks.
EARTHSYS 44N	The Invisible Majority: The Microbial World That Sustains Our Planet		X	Microbes are often viewed through the lens of infectious disease yet they play a much broader and underappreciated role in sustaining our Earth system. From introducing oxygen into the Earth's atmosphere over 2 billion years ago to consuming greenhouse gases today, microbial communities have had (and continue to have) a significant impact on our planet. In this seminar, students will learn how microbes transformed the ancient Earth environment into our modern planet, how they currently sustain our Earth's ecosystems, and how scientists study them both in the present and in the past. Students will be exposed to the fundamentals of microbiology, biogeochemistry, and Earth history.

EARTHSYS 103	Understanding Energy (Same as CEE 107A, CEE 207A)		X	Energy is one of the world's main drivers of opportunity and development for human beings. At the same time, our energy system has significant consequences for our society, political system, economy, and environment. For example, energy production and use is the #1 source of greenhouse gas emissions. This course surveys key aspects of each energy resource, including significance and potential conversion processes and technologies, drivers and barriers, policy and regulatory environment, and social, economic, and environmental impacts. Both depletable and renewable energy resources are covered, including oil, natural gas, coal, nuclear, biomass, hydroelectric, wind, solar, photovoltaics, geothermal, and ocean energy, with cross-cutting topics including electricity, storage, climate change, sustainability, green buildings, energy efficiency, transportation, and the developing world. Understanding Energy is part of a trio of inter-related courses aimed at gaining an in-depth understanding of each energy resource - from fossil fuels to renewable energy. The other two classes are CEE107W/207W Understanding Energy - Workshop, and CEE 107F/207F Understanding Energy -- Field Trips. Note that this course was formerly called Energy Resources ( CEE 173A/207A)
EARTHSYS 105	Food and Community: Creating Change through Education and Outreach		X	In this community-engaged learning course, students will learn about local efforts to bring about positive change in the Bay Area food system, with a particular focus on nutrition and garden-based education and outreach programs designed to encourage healthy and sustainable behaviors. Through field trips, readings, and work with community partner organizations, students will develop familiarity with diverse organizations and engagement strategies, and gain practical, hands-on experience designing and carrying out community-oriented projects. Cardinal Course (certified by Haas Center). Limited enrollment. May be repeated for credit.
EARTHSYS 105A	Ecology and Natural History of Jasper Ridge Biological Preserve (Same as BIO 105A)		X	Formerly 96A - Jasper Ridge Docent Training. First of two-quarter sequence training program to join the Jasper Ridge education/docent program. The scientific basis of ecological research in the context of a field station, hands-on field research, field ecology and the natural history of plants and animals, species interactions, archaeology, geology, hydrology, land management, multidisciplinary environmental education; and research projects, as well as management challenges of the preserve presented by faculty, local experts, and staff. Participants lead research-focused educational tours, assist with classes and research, and attend continuing education classes available to members of the IRBP community after the course.
EARTHSYS 105B	Ecology and Natural History of Jasper Ridge Biological Preserve (Same as BIO 105B)		X	Formerly 96B - Jasper Ridge Docent Training. First of two-quarter sequence training program to join the Jasper Ridge education/docent program. The scientific basis of ecological research in the context of a field station, hands-on field research, field ecology and the natural history of plants and animals, species interactions, archaeology, geology, hydrology, land management, multidisciplinary environmental education; and research projects, as well as management challenges of the preserve presented by faculty, local experts, and staff. Participants lead research-focused educational tours, assist with classes and research, and attend continuing education classes available to members of the IRBP community after the course.
EARTHSYS 110	Introduction to the foundations of contemporary geophysics (Same as GEOPHYS 110)	X		Introduction to the foundations of contemporary geophysics. Topics drawn from four broad themes in: whole Earth geodynamics, geohazards, natural resources, and environment/sustainability. In each case the focus is on how the interpretation of a variety of geophysical measurements (e.g., gravity, seismology, heat flow, magnetism, electromagnetics, and geodesy) can be used to provide fundamental insight into the behavior of the Earth's complex geosystems.
EARTHSYS 112	Human Society and Environmental Change (Same as ESS 112, HISTORY 103D)		X	Interdisciplinary approaches to understanding human-environment interactions with a focus on economics, policy, culture, history, and the role of the state.
EARTHSYS 116	Ecology of the Hawaiian Islands (Same as BIO 116)	X		Terrestrial and marine ecology and conservation biology of the Hawaiian Archipelago. Taught in the field in Hawaii as part of quarter-long sequence of courses including Earth Sciences and Anthropology. Topics include ecological succession, plant-soil interactions, conservation biology, biological invasions and ecosystem consequences, and coral reef ecology. Restricted to students accepted into the Earth Systems of Hawaii Program.
EARTHSYS 117	Earth Sciences of the Hawaiian Islands (Same as EARTH 117, ESS 117)		X	Progression from volcanic processes through rock weathering and soil-ecosystem development to landscape evolution. The course starts with an investigation of volcanic processes, including the volcano structure, origin of magmas, physical-chemical factors of eruptions. Factors controlling rock weathering and soil development, including depth and nutrient levels impacting plant ecosystems, are explored next. Geomorphic processes of landscape evolution including erosion rates, tectonic/volcanic activity, and hillslope stability conclude the course. Methods for monitoring and predicting eruptions, defining spatial changes in landform, landform stability, soil production rates, and measuring biogeochemical processes are covered throughout the course. This course is restricted to students accepted into the Earth Systems of Hawaii Program.
EARTHSYS 131	Pathways in Sustainability Careers (Same as EARTH 131)		X	Interactive, seminar-style sessions expose students to diverse career pathways in sustainability. Professionals from a variety of careers discuss their work, their career development and decision-points in their career pathways, as well as life style aspects of their choices.
EARTHSYS 135	Podcasting the Anthropocene (Same as EARTHSYS 235)		X	Identification and interview of Stanford researchers to be featured in an audio podcast. Exploration of interviewing techniques, audio storytelling, audio editing, and podcasting as a newly emerging media platform. Individual and group projects. Group workshops focused on preparation, review, and critiques of podcasts.

EARTHSYS 138	International Urbanization Seminar: Cross-Cultural Collaboration for Sustainable Urban Development (Same as CEE 126, IPS 274, URBANST 145)		X	Comparative approach to sustainable cities, with focus on international practices and applicability to China. Tradeoffs regarding land use, infrastructure, energy and water, and the need to balance economic vitality, environmental quality, cultural heritage, and social equity. Student teams collaborate with Chinese faculty and students partners to support urban sustainability projects. Limited enrollment via application; see internationalurbanization.org for details.
EARTHSYS 141	Remote Sensing of the Oceans (Same as EARTHSYS 241, ESS 141, ESS 241, GEOPHYS 141)	X		How to observe and interpret physical and biological changes in the oceans using satellite technologies. Topics: principles of satellite remote sensing, classes of satellite remote sensors, converting radiometric data into biological and physical quantities, sensor calibration and validation, interpreting large-scale oceanographic features.
EARTHSYS 144	Fundamentals of Geographic Information Science (GIS) (Same as ESS 164)		X	Survey of geographic information including maps, satellite imagery, and census data, approaches to spatial data, and tools for integrating and examining spatially-explicit data. Emphasis is on fundamental concepts of geographic information science and associated technologies. Topics include geographic data structure, cartography, remotely sensed data, statistical analysis of geographic data, spatial analysis, map design, and geographic information system software. Computer lab assignments. All students are required to attend a weekly lab on Tuesdays or Thursdays from 6 pm to 9 pm.
EARTHSYS 148	Grow it, Cook it, Eat it. An Experiential Exploration of How and Why We Eat What We Eat		X	This course provides an introductory exploration of the social, cultural, and economic forces that influence contemporary human diets. Through the combination of interrelated lectures by expert practitioners and hands-on experience planting, tending, harvesting, cooking, and eating food from Stanford's dining hall gardens, students will learn to think critically about modern agricultural practices and the relationship between cuisine and human and ecological health outcomes. Students will also learn and apply basic practices of human-centered design to develop simple frameworks for understanding various eating behaviors in Stanford's dining halls and to develop and test hypotheses for how R&DE Stanford Dining might influence eating behaviors to effect better health outcomes for people and the planet. This class, which is offered through the FEED Collaborative in the School of Earth, Energy and Environmental Sciences, requires an application. For more information about the FEED Collaborative, application procedures and deadlines, and other classes we teach, please visit our website at <a href="http://feedcollaborative.org">http://feedcollaborative.org</a> .
EARTHSYS 185	Feeding Nine Billion		X	Feeding a growing and wealthier population is a huge task, and one with implications for many aspects of society and the environment. There are many tough choices to be made- on fertilizers, groundwater pumping, pesticide use, organics, genetic modification, etc. Unfortunately, many people form strong opinions about these issues before understanding some of the basics of how food is grown, such as how most farmers currently manage their fields, and their reasons for doing so. The goal of this class is to present an overview of global agriculture, and the tradeoffs involved with different practices. Students will develop two key knowledge bases: basic principles of crop ecology and agronomy, and familiarity with the scale of the global food system. The last few weeks of the course will be devoted to building on this knowledge base to evaluate different future directions for agriculture.
EARTHSYS 187	FEED the Change: Redesigning Food Systems		X	Introductory course in design thinking and food system analysis offered through the FEED Collaborative. Targeted at upper-class undergraduates, this course provides a series of diverse, primarily hands-on experiences (design projects, field work, and storytelling) in which students both learn and apply the process of human-centered design to projects of real consequence in the food system. Students will also develop knowledge and basic tools for working effectively in teams and for analyzing complex systems. The goal of this course is to develop the creative confidence of students and, in turn, to work collaboratively with thought leaders in the local food system to design innovative solutions to the challenges they face. Admission is by application: <a href="http://feedcollaborative.org/classes/">http://feedcollaborative.org/classes/</a> .
EARTHSYS 188	Social and Environmental Tradeoffs in Climate Decision-Making (Same as EARTHSYS 288)		X	How can we ensure that measures taken to mitigate global climate change don't create larger social and environmental problems? What metrics should be used to compare potential climate solutions beyond cost and technical feasibility, and how should these metrics be weighed against each other? How can modeling efforts and stakeholder engagement be best integrated into climate decision making? What information are we still missing to make fully informed decisions between technologies and policies? Exploration of these questions, alongside other issues related to potential negative externalities of emerging climate solutions. Evaluation of energy, land use, and geoengineering approaches in an integrated context, culminating in a climate stabilization group project.
EARTHSYS 191	Concepts in Environmental Communication (Same as EARTHSYS 291)		X	Introduction to the history, development, and current state of communication of environmental science and policy to non-specialist audiences. Includes fundamental principles, core competencies, and major challenges of effective environmental communication in the public and policy realms and an overview of the current range and scope of research and practice in environmental communication. Intended for senior undergraduates and above with a background in environmental science and policy. Prerequisite: Earth Systems core ( EarthSys 111 and EarthSys 112) or equivalent.
EARTHSYS 196	Implementing Climate Solutions at Scale (Same as EARTHSYS 296)		X	Climate change is the biggest problem humanity has ever faced, and this course will teach students about the means and complexity of solving it. The instructors will guide the students in the application of key data and analysis tools for their final project, which will involve developing integrated plans for eliminating greenhouse gas emissions (100% reductions) by 2050 for a country, state, province, sector, or industry.

EARTHSYS 200	Environmental Communication in Action: The SAGE Project		X	Preference to graduate students and senior undergraduates in environmental, natural and social sciences, engineering, journalism. Students help produce and publish SAGE, an eco advice column, by choosing, researching, and answering questions about sustainable living submitted by Stanford alumni and the general public. (Meets Earth Systems WIM requirement).
EARTHSYS 206	World Food Economy (Same as EARTHSYS 106, ESS 106, ESS 206, ECON 206, ECON 106)		X	The economics of food production, consumption, and trade. The micro- and macro- determinants of food supply and demand, including the interrelationship among food, income, population, and public-sector decision making. Emphasis on the role of agriculture in poverty alleviation, economic development, and environmental outcomes. (graduate students enroll in 206)
EARTHSYS 210A	Senior Capstone and Reflection	X		The Earth Systems Senior Capstone and Reflection, required of all seniors, provides students with opportunities to synthesize and reflect on their learning in the major. Students participate in guided career development and planning activities and initiate work on an independent or group capstone project related to an Earth Systems problem or question of interest. In addition, students learn and apply principles of effective oral communication through developing and giving a formal presentation on their internship. Students must also take EARTHSYS 210P, Earth Systems Capstone Project, in the quarter following the Senior Capstone and Reflection Course.
EARTHSYS 210B	Senior Capstone and Reflection		X	The Earth Systems Senior Capstone and Reflection, required of all seniors, provides students with opportunities to synthesize and reflect on their learning in the major. Students participate in guided career development and planning activities and initiate work on an independent or group capstone project related to an Earth Systems problem or question of interest. In addition, students learn and apply principles of effective oral communication through developing and giving a formal presentation on their internship. Students must also take EARTHSYS 210P, Earth Systems Capstone Project, in the quarter following the Senior Capstone and Reflection Course.
EARTHSYS 210P	Earth Systems Capstone Project		X	Students work independently or in groups to complete their Senior Capstone Projects. They will participate in regular advising meetings with the instructor(s), and will give a final presentation on their projects at the end of the quarter in a special Earth Systems symposium.
EARTHSYS 225	Shades of Green: Redesigning and Rethinking the Environmental Justice Movements (Same as EARTHSYS 125, CSRE 125E)		X	Historically, discussions of race, ethnicity, culture, and equity in the environment have been relegated to the environmental justice movement, which often focuses on urban environmental degradation and remains separated from other environmental movements. This course will seek to break out of this limiting discussion. We will explore access to outdoor spaces, definitions of wilderness, who is and isn't included in environmental organizations, gender and the outdoors, how colonialism has influenced ways of knowing, and the future of climate change. The course will also have a design thinking community partnership project. Students will work with partner organizations to problem-solve around issues of access and diversity. We value a diversity of experiences and epistemological beliefs, and therefore undergraduates and graduate students from all disciplines are welcome.
EARTHSYS 235A	Podcasting the Anthropocene 1.0 (Same as EARTHSYS 135A)	X		The Anthropocene refers to the proposed geologic age defined by the global footprint of humankind. It's an acknowledgement of the tremendous influence people and societies exert on Earth systems. In this course, students research, prepare, and conduct audio interviews related to the Anthropocene with experts of their choosing. Instructors will help facilitate interviews and prepare student for the experience. Throughout the quarter students will participate in group workshops. This is a project-based course resulting in two long-form interviews. The expectation at the end of the quarter is to publish interviews via the Generation Anthropocene podcast, with possible opportunities to cross post in collaboration with external media partners. Students hoping to take EarthSys 135/235 during winter quarter are strongly encouraged to enroll in EarthSys 135A/235A. (Cardinal Course certified by the Haas Center).
EARTHSYS 236	The Ethics of Stewardship (Same as EARTHSYS 136)		X	What responsibilities do humans have to nonhuman nature and future generations? How are human communities and individuals shaped by their relationships with the natural world? What are the social, political, and moral ramifications of drawing sustenance and wealth from natural resources? Whether we realize it or not, we grapple with such questions every time we turn on the tap, fuel up cars, or eat meals -and they are key to addressing issues like global climate change and environmental justice. In this class, we consider several perspectives on this ethical question of stewardship: the role of humans in the global environment. In addition to reading written work and speaking with land stewards, we will practice stewardship at the Stanford Educational Farm.
EARTHSYS 238	Land Use Law	X		This course focuses on the pragmatic (more than theoretical) aspects of contemporary land use law and policy, including: the tools and legal foundation of modern land use law; the process of land development; vested property rights, development agreements, and takings; growth control, sprawl, and housing density; and direct democracy over land use. We explore how land use decisions affect environmental quality and how land use decision-making addresses environmental impacts. Special Instructions: All graduate students from other departments are encouraged to enroll, and no pre-requisites apply. Student participation is essential. Roughly two-thirds of the class time will involve a combination of lecture and classroom discussion. The remaining time will engage students in case studies based on actual land use issues and disputes.

EARTHSYS 243	Environmental Advocacy and Policy Communication		X	Although environmental science suggests that coordinated policy action is critically necessary to address a host of pressing issues - from global climate change to marine pollution to freshwater depletion - governments have been slow to act. This course focuses on the translation of environmental science to public discourse and public policy, with an emphasis on the causes of our current knowledge-to-action gap and policy-sphere strategies to address it. We will read classic works of environmental advocacy, map our political system and the public relations and lobbying industries that attempt to influence it, grapple with analytical perspectives on effective and ethical environmental policy communication, engage with working professionals in the field, learn effective strategies for written and oral communication with policymakers, and write and workshop op-eds.
EARTHSYS 249	Wild Writing (Same as EARTHSYS 149)		X	What is wilderness and why does it matter? In this course we will interrogate answers to this question articulated by influential and diverse American environmental thinkers of the 19th, 20th, and 21st centuries, who through their writing transformed public perceptions of wilderness and inspired such actions as the founding of the National Park System, the passage of the Wilderness Act and the Clean Air and Water Acts, the establishment of the Environmental Protection Agency, and the birth of the environmental and climate justice movements. Students will also develop their own responses to the question of what is wilderness and why it matters through a series of writing exercises that integrate personal narrative, wilderness experience, and environmental scholarship, culminating in a ~3000 word narrative nonfiction essay. This course will provide students with knowledge, tools, experience, and skills that will empower them to become more persuasive environmental storytellers and advocates. (Graduate students register for COMM 177C / EARTHSYS 277C.) A practical, writing-intensive course for science and journalism students that begins with the assumption that you already know how to research and relay the essential facts of almost any environmental story. You will go beyond the basics, both as reporters and storytellers. Learn how to write stories that stand on fact but move like fiction, that have protagonists and antagonists, that create suspense, that reveal character through dialogue and action, and that pay off with resonant finales. Limited enrollment: preference to journalism students and students in the natural and environmental sciences. Prerequisite: COMM 104, EARTHSYS 200 or consent of instructor. Admission by application only, available from thayden@stanford.edu. Applications due Nov. 30, 2015.
EARTHSYS 277C	Specialized Writing and Reporting: Environmental Journalism (Same as EARTHSYS 177C, COMM 177C, COMM 277C)		X	(Graduate students register for COMM 177C / EARTHSYS 277C.) A practical, writing-intensive course for science and journalism students that begins with the assumption that you already know how to research and relay the essential facts of almost any environmental story. You will go beyond the basics, both as reporters and storytellers. Learn how to write stories that stand on fact but move like fiction, that have protagonists and antagonists, that create suspense, that reveal character through dialogue and action, and that pay off with resonant finales. Limited enrollment: preference to journalism students and students in the natural and environmental sciences. Prerequisite: COMM 104, EARTHSYS 200 or consent of instructor. Admission by application only, available from thayden@stanford.edu. Applications due Nov. 30, 2015.
EARTHSYS 289A	FEED Lab: Food System Design & Innovation		X	FEED Lab is a 3-4 unit introductory course in design thinking and food system innovation offered through the FEED Collaborative. Targeted at graduate students interested in food and the food system, this course provides a series of diverse, primarily hands-on experiences (design projects with industry-leading thinkers, field work, and collaborative leadership development) in which students both learn and apply the process of human-centered design to projects of real consequence in the food system. The intent of this course is to develop students' creative confidence, collaborative leadership ability, and skills in systems thinking to prepare them to be more effective as innovators and leaders in the food system. This course is mandatory for any student wishing to qualify for the FEED Collaborative's summer Leadership and Innovation Program, in which select students participate in full-time, paid, externship roles with collaborating thought-leaders in the industry. Admission is by application: <a href="http://feedcollaborative.org/classes/">http://feedcollaborative.org/classes/</a> .
EARTHSYS 292	Multimedia Environmental Communication		X	Theory and practice of effective, accurate and engaging use of photography and web video production in environmental communication. Emphasis on group project work and peer critiquing in each modality, including some out-of-class work time. Limited class size, preference to Earth Systems Master's students.
EARTHSYS 294	Environmental Communication Capstone		X	Group-project based course focused on applying the skills and theoretical understanding gained through the Environmental Communication Master of Arts in Earth Systems course progression to a real-world communication challenge. Students design, plan, and implement an integrated communication strategy around a defined environmental topic or research program, such as the implementation of the new student farm; a specific research group's laboratory or expedition work; or an topic or concept of interest across research groups, such as climate change adaptation or marine conservation. Restricted to students enrolled in the Environmental Communication Master of Arts in Earth Systems, or by permission of the instructor.
EARTHSYS 323	Stanford at Sea		X	Five weeks of marine science including oceanography, marine physiology, policy, maritime studies, conservation, and nautical science at Hopkins Marine Station, followed by five weeks at sea aboard a sailing research vessel in the Pacific Ocean. Shore component comprised of three multidisciplinary courses meeting daily and continuing aboard ship. Students develop an independent research project plan while ashore, and carry out the research at sea. In collaboration with the Sea Education Association of Woods Hole, MA. Only 6 units may count towards the Biology major.
EARTHSYS 170	Environmental Geochemistry (Same as GS 170, GS 270)	X		Solid, aqueous, and gaseous phases comprising the environment, their natural compositional variations, and chemical interactions. Contrast between natural sources of hazardous elements and compounds and types and sources of anthropogenic contaminants and pollutants. Chemical and physical processes of weathering and soil formation. Chemical factors that affect the stability of solids and aqueous species under earth surface conditions. The release, mobility, and fate of contaminants in natural waters and the roles that water and dissolved substances play in the physical behavior of rocks and soils. The impact of contaminants and design of remediation strategies. Case studies. Prerequisite: 90 or consent of instructor.

EASTASN 265	Politics, Governance and Development in Contemporary Southeast Asia (Same as EASTASN 165)	X		This course will explore the major political, governance and development challenges facing contemporary Southeast Asia. In doing so it will identify key political and governance challenges common across Southeast Asia and explore the reasons for highly diverse institutional and policy responses. Students will be required to develop a detailed knowledge of at least two countries' responses to a common political or developmental challenge. Countries covered include Indonesia, Malaysia, Myanmar, the Philippines, Singapore, Thailand, and Vietnam.
EASTASN 285	The United States, China, & Global Security	X		This graduate-level seminar will be taught simultaneously on the campuses of Stanford University and Peking University and will feature a lecture series in which prominent American and Chinese scholars provide presentations that focus on key global security issues. The course content will highlight topics relevant to current U.S.- China relations and their respective roles in Asian and global security. Proposed lecture topics include: an introduction to U.S.- China relations; finance, trade, and investment; cyber security; nonproliferation; maritime security; terrorism; and energy and the environment. Hosted jointly by Stanford University and Peking University, enrollment will be limited to 20 students at each campus and, at Stanford, will be restricted to graduate students. Enrollment is competitive, so potential students must complete an application by February 5, 2016 (noon): <a href="http://ceas.stanford.edu/students/courses.php">http://ceas.stanford.edu/students/courses.php</a>
EASTASN 289K	Higher Education and Development in Korea (Same as EASTASN 189K)	X		As the Republic of Korea (i.e. Korea) faces new challenges of economic stagnation, the role of higher education has become a major focus of policy attention in recent decades. In particular, in the context of a shrinking working-age population and declining birth rates, the globalization of higher education in Korea has been viewed as a viable solution to attracting skilled labor, questioning long-held cultural beliefs and practices and moving beyond the dominant idea of South Korea as an ethnically "homogenous" country. How has Korea globalized its higher education sector in recent decades? How has the internal sociology of Korean universities changed as a result and what contradictions and challenges remain? How can higher education reform affect Korea's future development? This course examines the role of globalization of higher education in Korea and its broader implications for social and cultural change in Korea and Asia.
ECON 11N	Understanding the Welfare System	X		Welfare reform passed by the Federal Government in 1996 heralded a dramatic step in how our nation designs and operates its programs that support poor families. The centerpiece of this legislation known as 'devolution' transferred much responsibility for these programs to the states. States had their first opportunity since the 'war on poverty' of the 1960s to undertake radical changes in setting up their public assistance programs. Recently, many of the reforms instituted in the 1990s are being hotly debated and in some aspects reversed. What flexibility did the states receive under welfare reform, and what considerations are relevant in exercising this flexibility? What selections have states made, and how are their programs and those of the federal government likely to evolve in the future? This seminar will address these questions, exploring how reforms changed welfare and who has been affected by these changes. In addition to covering the patchwork of different programs that currently constitute America's social safety net, the seminar will also scrutinize the makeup and trends in government spending and how our nation defines poverty and eligibility for income support. Moreover, the discussion will illustrate the role that economics plays in assessing the effectiveness of anti-poverty programs and the consequences on families' behavior. Students will participate in a project in which they develop their own recommendations for devising a safety net for poor families in America.
ECON 17N	Energy, the Environment, and the Economy		X	Examines the intimate relationship between environmental quality and the production and consumption of energy. Assesses the economics efficiency and political economy implications of a number of current topics in energy and environmental economics. Topics include: the economic theory of exhaustible resources, Greenhouse Gas Emissions (GHG) control (cap and trade mechanisms and carbon fees), GHG emissions offsets, the Strategic Petroleum Reserve (SPR), the "smart" transmission grid for electricity, nuclear energy and nuclear waste, the real cost of renewable energy, natural gas and coal-fired electricity production, the global coal and natural gas markets, Corporate Average Fuel Efficiency (CAFE) and Low-Carbon Fuel Standards (LCFS), Energy Efficiency Investments and Demand Response, and Carbon Capture and Sequestration (CCS). For all topics, there will be reading to explain the economics and engineering behind the topic and class discussion to clarify and elaborate on this interaction.
ECON 19Q	Measuring the Performance of Governments in the U.S. (Same as PUBLPOL 19Q)	X		Spending by federal, state, and local governments accounts for about one-third of U.S. GDP and governments employ more than one-in-seven workers in the U.S. For most U.S. residents, government is represented by a complicated web of federal, state, and local policies. There is an increasingly contentious debate about the proper role of the government and regarding the impact of specific government policies. This debate is rarely grounded in a common set of facts. In this seminar, we will explore how each level of government interacts with U.S. residents through government services, public programs, taxes, and regulations. We will examine financial results for different levels of government while considering the net effects of government intervention on the health and economic well-being of individuals and families. Particular attention will be paid to certain sectors (e.g. education, health care, etc.) and to certain groups (e.g. those in poverty, the elderly, etc.). Along the way we will accumulate a set of metrics to assess the performance of each level of government while highlighting the formidable challenges of such an exercise.

ECON 22N	Causes and Consequences of the Rise in Inequality	X		In this class we will discuss the economic and institutional causes of the rise in inequality in the US and other countries over the last 40 years. We will also discuss the consequences of inequality in terms of social justice, economic welfare, aggregate economic performance, intergenerational mobility, and the possible implications of inequality for the recent <u>global financial crisis</u> .
ECON 22N	Animal Use in Biomedical Research	X		Preference to freshmen. How and why animals are used in biomedical science. Addresses human and animal disease entities and how animal research has contributed to the treatment and cure of disease. Significant portions of this course are devoted to documenting the humane care and treatment of laboratory animals in research, including, but not limited to such topics as laws and ethics, animal behavior, animal modeling, and the animal activist movement. Course topics will also include: What advances have been made as a result of the use of animals in research? Who conducts animal research? Predominant animal species used in biomedical research, facts and myths; the regulation of biomedical research; housing and care of laboratory animals; why new drugs must be tested; animal use in stem cell research, cancer research and genetically engineered mice; career choices in biomedical research.
ECON 27N	The Economics of Gender	X		This seminar draws on empirical and theoretical insights from multiple fields within economics. The objective is to understand the role of gender in economic decision making, and the changing significance, timing and meaning of work, career and family. We will focus on recent work in experimental economics, and empirical work in the developed world. But at times we will widen the perspective to developing countries and consider historical changes as well.
ECON 45	Using Big Data to Solve Economic and Social Problems	X		This course will show how "big data" can be used to understand and solve some of the most important social and economic problems of our time. The course will give students an introduction to frontier research in applied economics and social science in a non-technical manner. Topics include equality of opportunity, education, income inequality, racial segregation, innovation and entrepreneurship, social networks, urban planning, health, crime, and political partisanship. In the context of these topics, the course will also provide a non-technical introduction to basic statistical methods and data analysis techniques, including regression analysis, causal inference, quasi-experimental methods, and machine learning. Optional sections will provide a more advanced treatment of these methods for interested students. Each week, the course will include a guest lecturer from a Silicon Valley firm or government agency who will discuss real-world applications of data science.
ECON 106	World Food Economy (Same as EARTHYSYS 106, ESS 106, EARTHYSYS 206, ESS 206, ECON 206)		X	The economics of food production, consumption, and trade. The micro- and macro- determinants of food supply and demand, including the interrelationship among food, income, population, and public-sector decision making. Emphasis on the role of agriculture in poverty alleviation, economic development, and environmental outcomes. (graduate students enroll in 206)
ECON 116	American Economic History (Same as AMSTUD 116, HISTORY 156)	X		The American economy from colonial times to the present, illustrating the role of history in economic life. Topics: U.S. economic development in global and comparative context; slavery as an economic system; emergence of American technology and business organization; economics of the Great Depression and the New Deal; post-World War II economic performance and social change; globalization, information technology, and inequality.
ECON 118	Development Economics	X		The microeconomic problems and policy concerns of developing countries. Topics include: land productivity; risk and insurance; microfinance; health and nutrition; education; gender; politics and corruption. Emphasis is on economic <u>models and econometric evidence</u> .
ECON 128	Economic Development: A Historical Perspective	X		An introduction to the study of the financial lives of households in less developed countries, focusing on savings, credit, <u>informal insurance, the expansion of microfinance, and social networks</u> .
ECON 136	Market Design	X		Use of economic theory and analysis to design allocation mechanisms and market institutions. Course focuses on three areas: the design of matching algorithms to solve assignment problems, with applications to school choice, entry-level labor markets, and kidney exchanges; the design of auctions to solve general resource allocation problems, with applications to the sale of natural resources, financial assets, and advertising; and the design of platforms and exchanges, with applications to internet markets. Emphasis on connecting economic theory to practical applications. <u>Students must write term paper</u> .
ECON 146	Economics of Education	X		How a decision to invest in education is affected by factors including ability and family background. Markets for elementary and secondary schooling; topics such as vouchers and charter schools, accountability, expenditure equalization among schools, and the teacher labor market. The market for college education emphasizing how college tuition is determined, and whether students are matched efficiently with colleges. How education affects economic growth, focusing on developing countries. Theory and empirical results. Application of economics from fields such as public economics, labor economics, macroeconomics, and industrial organization.
ECON 155	Environmental Economics and Policy		X	Economic sources of environmental problems and alternative policies for dealing with them (technology standards, emissions taxes, and marketable pollution permits). Evaluation of policies addressing regional air pollution, global climate change, water allocation in the western U.S., and the use of renewable resources. Connections between <u>population growth, economic output, environmental quality, and human welfare</u> .

ECON 159	Economic, Legal, and Political Analysis of Climate-Change Policy		X	This course will advance students understanding of economic, legal, and political approaches to avoiding or managing the problem of global climate change. Theoretical contributions as well as empirical analyses will be considered. In addition to examining economic issues and legal constraints, it will address the political economy of various emissions-reduction strategies. The course will consider policy efforts at the local, national, and international levels. Specific topics include: interactions among overlapping climate policies and between new policies and pre-existing legal or regulatory frameworks; the role that jurisdictional or geographic scale can play in influencing the performance of climate-policy approaches; and numerical modeling and statistical analyses of climate-change policies.
ECON 162	Games Developing Nations Play (Same as POLISCI 247A, POLISCI 347A)	X		If, as economists argue, development can make everyone in a society better off, why do leaders fail to pursue policies that promote development? The course uses game theoretic approaches from both economics and political science to address this question. Incentive problems are at the heart of explanations for development failure. Specifically, the course focuses on a series of questions central to the development problem: Why do developing countries have weak and often counterproductive political institutions? Why is violence (civil wars, ethnic conflict, military coups) so prevalent in the developing world, and how does it interact with development? Why do developing economies fail to generate high levels of income and wealth? We study how various kinds of development traps arise, preventing development for most countries. We also explain how some countries have overcome such traps. This approach emphasizes the importance of simultaneous economic and political development as two different facets of the same developmental process. No background in game theory is required.
ECON 182	Honors Market Design	X		Rigorous introduction to the theory of matching and resource allocation, and its application to practical market design. Theory covers two-sided matching, "house allocation" problems, random assignment, and their variants. Applied topics include school choice, labor market, house allocation, and organ allocation for transplantation. Final paper required. Forms a sequence with ECON 180 and ECON 181, but can be taken independently. Prerequisites: Experience with abstract mathematics and willingness to work hard. No prior knowledge of economics is required, although basic knowledge in game theory is useful.
ECON 206	World Food Economy (Same as EARTHSYS 106, ESS 106, EARTHSYS 206, ESS 206, ECON 106)		X	The economics of food production, consumption, and trade. The micro- and macro- determinants of food supply and demand, including the interrelationship among food, income, population, and public-sector decision making. Emphasis on the role of agriculture in poverty alleviation, economic development, and environmental outcomes. (graduate students enroll in 206)
ECON 215	Development Economics II	X		This is a course focusing on macro development research. It will cover dynamic models of growth and development, with a focus on migration; technological change; the functioning of financial markets; and barriers to agricultural productivity in less developed countries.
ECON 216	Development Economics III	X		Use of quantitative theory to understand various aspects of the growth and development process. Emphasis on family and demographic issues and their importance for development. Theoretical models of fertility and marriage decisions, and their empirical relevance. Unified growth theories: demographic transition and industrial revolution. Family institutions such as marriage payments and polygamy. The political economy of family-related institutions, e.g. the evolution of women's and children's rights. Female labor supply and development. Theories of disease and development.
ECON 241	Public Economics I	X		Introduction to key issues in public economics, including the optimal design of tax and transfer policy, income and wealth inequality and its policy implications, the empirical effect of taxes on earnings and savings, fiscal and debt policy, social mobility and the dynamics of taxation, and public finance issues in developing countries. Students will learn frontier theoretical, empirical and computational tools that are currently used to address policy questions.
ECON 242	Public Economics II	X		We explore the response of labor and income to taxation. We also explore fundamental tax reform, public goods, fiscal federalism, and local public goods. A special emphasis on government's role in education.
ECON 242	Beyond the Athlete: Intersection of Diversity, Storytelling, and Athletics	X		This course explores the interaction of one's identities within the context of athletics. With an emphasis on the importance of self-awareness and storytelling, we will navigate how all identities intersect and affect the privilege we receive within current society. We will specifically look at how race, ethnicity, sexual orientations, religion, socioeconomic status, mental health, and disabilities interact with the sphere of athletics. Beyond the Athlete: Intersection of Storytelling, Diversity, and Athletics will help students find their voice and use it for positive social change within their communities.
ECON 243	Public Economics III	X		The course covers various topics relating to social insurance. The first half of the course covers the rationale for government interventions into private insurance markets, adverse selection, social insurance design and the intersection between social insurance and intra-family insurance. The second half of the course covers local public policy through the lens of social insurance, and includes topics such as spatial equilibrium, place-based policies and housing policy. Prerequisites: Econ 202, 203, 204, 210, 270, 271, or equivalent with consent of instructor.
ECON 250	Environmental Economics		X	Theoretical and empirical analysis of sources of and solutions to environmental problems, with application to local pollution challenges and global environmental issues such as climate change. Topics include: analysis of market failure, choice of environmental policy instruments, integrating environmental and distortionary taxes, environmental policy making under uncertainty, valuing environmental amenities, and measuring /promoting sustainable development.

ECON 260	Industrial Organization III	X		Current research and policy questions in industrial organization. Course combines lectures by the instructors with <b>student presentations, with an emphasis on initiating dissertation research in industrial organization.</b>
ECON 315	Development Workshop	X		Workshop covering topics and case studies related to economic development.
ECON 341	Public Economics and Environmental Economics Seminar		X	Issues in measuring and evaluating the economic performance of government tax, expenditure, debt, and regulatory policies; their effects on levels and distribution of income, wealth, and environmental quality; alternative policies and methods of evaluation. Workshop format combines student research, faculty presentations, and guest speakers.
EDUC 102	Examining Social Structures, Power, and Educational Access	X		Goal is to prepare Education and Youth Development fellows for their work with adolescents in the Haas Center's pre-college summer programs and to define their role in addressing educational inequities in the summer programs and <b>beyond.</b>
EDUC 126A	Introduction to Public Service Leadership	X		Offered through the Haas Center for Public Service. A foundation and vision for a future of public service leadership. Students identify personal values and assess strengths as leaders. The ethics of public service and leadership theory.
EDUC 177B	Well-Being in Immigrant Children & Youth: A Service Learning Course (Same as CSRE 177F, CHILATST 177B)	X		This is an interdisciplinary course that will examine the dramatic demographic changes in American society that are challenging the institutions of our country, from health care and education to business and politics. This demographic transformation is occurring first in children and youth, and understanding how social institutions are responding to the needs of immigrant children and youth to support their well-being is the goal of this course.
EDUC 207	Education and Inequality: Big Data for Large-Scale Problems (Same as EDUC 107, SOC 107E, SOC 205)	X		In this course, students will use data from the Stanford Education Data Archive (SEDA) to study the patterns, causes, consequences, and remedies of educational inequality in the US. SEDA is based on 200 million test score records, administrative data, and census data from every public school, school district, and community in the US. The course will include lectures, discussion, and small group research projects using SEDA and other data.
EDUC 228H	Literacy, History, and Social Science	X		How elementary school teachers can teach history and social science within a literacy framework. Topics include: historical thinking, reading, and writing; current research; applying nonfiction reading and writing strategies to historical texts; using primary sources with elementary students; adapting instruction to meet student needs; state standards; evaluating curriculum; assessing student knowledge; developing history and social science units; and <b>embedding history and social science into the general literacy curriculum.</b>
EDUC 232	Culture, Learning, and Poverty	X		This course examines the categories and methods used to analyze and explain educational inequalities in the United States from 1950 to present. Approaches to theories of school failure and methods of intervention are distinguished by their ideas on the play of learning, language, cognition, culture, and social class in human development. Particular attention is given to the Culture of Poverty controversies of the 1960s and their recent emergence.
EDUC 267G	Integrating the Garden into the Elementary Curriculum		X	This mini-course uses the garden and kitchen environments to provide teacher candidates with real-world contexts in which to explore some of the key issues that children face in health, nutrition, and sustainability. Teacher candidates will gain an understanding of how to integrate the various themes with content areas and standards and an appreciation for the importance of addressing children's health needs in an era when the country is facing increased <b>obesity and other health problems.</b>
EDUC 299	Equity and Schooling	X		Introduction to the theories and practices of equity and democracy in education. How to think about teaching and <b>schooling in new ways; the individual moral and political reasons for becoming a teacher.</b>
EDUC 302	Behavior Design	X		Students learn Behavior Design and practice applying the methods to change human behavior in measurable ways. In <b>this particular course, all projects will focus on one theme: Connecting people to nature.</b>
EDUC 322	Community-based Research As Tool for Social Change: Discourses of Equity in Communities & Classrooms (Same as EDUC 123, AFRICAAM 130, CSRE 130)	X		Issues and strategies for studying oral and written discourse as a means for understanding classrooms, students, and teachers, and teaching and learning in educational contexts. The forms and functions of oral and written language in the classroom, emphasizing teacher-student and peer interaction, and student-produced texts. Individual projects <b>utilize discourse analytic techniques.</b>
EDUC 322	Australian Studies	X		Introduction to Australian society, history, culture, politics, and identity. Social and cultural framework and working understanding of Australia in relationship to the focus on coastal environment in other program courses. Field trips.
EDUC 332	Theory and Practice of Environmental Education		X	Foundational understanding of the history, theoretical underpinnings, and practice of environmental education as a tool for addressing today's pressing environmental issues. The purpose, design, and implementation of environmental education in formal and nonformal settings with youth and adult audiences. Field trip and community-based project offer opportunities for experiencing and engaging with environmental education initiatives.
EDUC 357	Science and Environmental Education in Informal Contexts	X		There are ever-expanding opportunities to learn science in contexts outside the formal classroom, in settings such as zoos, museums, and science centers. How are issues around science and the environment presented in these contexts, how do people behave and learn in these contexts, and what messages do they take away? This course will cover the learning theories and empirical research that has been conducted in these settings. Case studies of nearby science <b>centers will add an experiential dimension.</b>

EDUC 377B	Strategic Management of Nonprofit Organizations and Social Ventures (Same as STRAMGT 368)	X		(Same as STRAMGT 368). This course seeks to provide a survey of the strategic, governance, and management issues facing a wide range of nonprofit organizations and their executive and board leaders, in the era of venture philanthropy and social entrepreneurship. The students will also be introduced to core managerial issues uniquely defined by this sector such as development/fundraising, investment management, performance management and nonprofit finance. The course also provides an overview of the sector, including its history and economics. Cases involve a range of nonprofits, from smaller, social entrepreneurial to larger, more traditional organizations, including education, social service, environment, health care, religion, NGO's and performing arts. In exploring these issues, this course reinforces the frameworks and concepts of strategic management introduced in the core first year courses. In addition to case discussions, the course employs role plays, study group exercises and many outsider speakers.
EDUC 377H	Diverse Leadership as an Imperative for Impact - Lessons from Education (Same as GSBGEN 377)	X		Our society implicitly prizes a particular approach to leadership - but today's cross-sectoral, impact-oriented leader cannot afford to be restricted to a single approach. If we aspire to address challenges across social, economic, and political arenas, with highly charged moral implications and multiple stakeholders, we have an imperative to use all available tools by discovering, celebrating, and advancing diversity in leadership. Education provides the perfect canvas on which to explore this imperative. In this course, we will: (1) study a range of effective leadership approaches in the context of education; (2) develop broad, transportable skills and frameworks required to lead in any complex setting - business, public sector, nonprofit sector; (3) delve into leadership tradeoffs and tensions; (4) explore and understand our own values and tacit and explicit decision-making criteria; and (5) recognize barriers to diversity and tactics to address them. Guiding questions will include: How does the context shape the solution set? What does inspired and inspiring leadership look like? How do race/gender/other identities enter into the equation? How do I develop my own brand of leadership? We will examine contemporary leaders and controversies from education, draw upon timeless historical thinkers, enjoy the wisdom of guest speakers, and work intensively in small groups to highlight challenges, opportunities, and tradeoffs. By exploring a range of approaches and situations, we will strive for deeper understanding of ourselves and of the context to become a more capable, empathetic and effective leaders.
EDUC 389A	Race, Ethnicity, and Language: Racial, Ethnic, and Linguistic Formations (Same as LINGUIST 253, ANTHRO 320A, CSRE 389A)	X		Language, as a cultural resource for shaping our identities, is central to the concepts of race and ethnicity. This seminar explores the linguistic construction of race and ethnicity across a wide variety of contexts and communities. We begin with an examination of the concepts of race and ethnicity and what it means to "do race," both as scholarship and as part of our everyday lives. Throughout the course, we will take a comparative perspective and highlight how different racial/ethnic formations (Asian, Black, Latino, Native American, White, etc.) participate in similar, yet different, ways of drawing racial and ethnic distinctions. The seminar will draw heavily on scholarship in (linguistic) anthropology, sociolinguistics and education. We will explore how we talk and don't talk about race, how we both position ourselves and are positioned by others, how the way we talk can have real consequences on the trajectory of our lives, and how, despite this, we all participate in maintaining racial and ethnic hierarchies and inequality more generally, particularly in schools.
EDUC 429S	History of American Indian Education	X		How the federal government placed education at the center of its Indian policy in second half of 19th century, subjecting Native Americans to programs designed to erase native cultures and American Indian responses to those programs. Topics include traditional Indian education, role of religious groups, Meriam Report, Navajo-Hopi Rehabilitation Act, Johnson-O'Malley Act, and public schools.
EE 60N	Man versus Nature: Coping with Disasters Using Space Technology (Same as GEOPHYS 60N)	X		Preference to freshman. Natural hazards, earthquakes, volcanoes, floods, hurricanes, and fires, and how they affect people and society; great disasters such as asteroid impacts that periodically obliterate many species of life. Scientific issues, political and social consequences, costs of disaster mitigation, and how scientific knowledge affects policy. How spaceborne imaging technology makes it possible to respond quickly and mitigate consequences; how it is applied to natural disasters; and remote sensing data manipulation and analysis. GER:DB-EngrAppSci
EE 65	Modern Physics for Engineers	X		This course introduces the core ideas of modern physics that enable applications ranging from solar energy and efficient lighting to the modern electronic and optical devices and nanotechnologies that sense, process, store, communicate and display all our information. Though the ideas have broad impact, the course is widely accessible to engineering and science students with only basic linear algebra and calculus through simple ordinary differential equations as mathematics background. Topics include the quantum mechanics of electrons and photons (Schrödinger's equation, atoms, electrons, energy levels and energy bands; absorption and emission of photons; quantum confinement in nanostructures), the statistical mechanics of particles (entropy, the Boltzmann factor, thermal distributions), the thermodynamics of light (thermal radiation, limits to light concentration, spontaneous and stimulated emission), and the physics of information (Maxwell's demon, reversibility, entropy and noise in physics and information theory). Pre-requisite: Physics 41. Pre- or co-requisite: Math 53 or CME 102.
EE 153	Power Electronics (Same as EE 253)		X	Addressing the energy challenges of today and the environmental challenges of the future will require efficient energy conversion techniques. This course will discuss the circuits used to efficiently convert ac power to dc power, dc power from one voltage level to another, and dc power to ac power. The components used in these circuits (e.g., diodes, transistors, capacitors, inductors) will also be covered in detail to highlight their behavior in a practical implementation. A lab will be held with the class where students will obtain hands on experience with power electronic circuits. Formerly EE 292L. Prerequisite: EE 101B

EE 155	Green Electronics (Same as EE 255)		X	Many green technologies including hybrid cars, photovoltaic energy systems, efficient power supplies, and energy-conserving control systems have at their heart intelligent, high-power electronics. This course examines this technology and uses green-tech examples to teach the engineering principles of modeling, optimization, analysis, simulation, and design. Topics include power converter topologies, periodic steady-state analysis, control, motors and drives, photovoltaic systems, and design of magnetic components. The course involves a hands-on laboratory and a substantial final project. Formerly EE 152. Required: EE101B, EE102A, EE108. Recommended: ENGR40 or EE122A.
EE 213	Digital MOS Integrated Circuits	X		Looks a little more deeply at how digital circuits operate, what makes a gate digital, and how to "cheat" to improve performance or power. To aid this analysis we create a number of different models for MOS transistors and choose the simplest one that can explain our the circuit's operation, using both hand and computer analysis. We explore static, dynamic, pulse-mode, and current mode logic, and show how they are are used in SRAM design. Topics include sizing for min delay, noise and noise margins, power dissipation. The class uses memory design (SRAM) as a motivating example. DRAM and EEPROM design issues are also covered. Formerly EE 313. Prerequisites: EE 101B, EE 108. <del>Recommended: EE 271</del>
EE 216	Principles and Models of Semiconductor Devices	X		Carrier generation, transport, recombination, and storage in semiconductors. Physical principles of operation of the p-n junction, heterojunction, metal semiconductor contact, bipolar junction transistor, MOS capacitor, MOS and junction field-effect transistors, and related optoelectronic devices such as CCDs, solar cells, LEDs, and detectors. First-order device models that reflect physical principles and are useful for integrated-circuit analysis and design.
EE 243	Semiconductor Optoelectronic Devices	X		Semiconductor physics and optical processes in semiconductors. Operating principles and practical device features of semiconductor optoelectronic materials and heterostructures. Devices include: optical detectors (p-i-n, avalanche, and MSM); light emitting diodes; electroabsorptive modulators (Franz-Keldysh and QCSE), electrorefractive (directional couplers, Mach-Zehnder), switches (SEEDs); and lasers (waveguide and vertical cavity surface emitting).
EE 254	Advanced Topics in Power Electronics	X		In this course, we will study the practical issues related to the practical design of power electronic converters. We will also explore the trade-offs involved in selecting among the different circuits used to convert ac to dc, dc to ac and back to dc over a wide range of power levels suitable for different applications. In Advanced Topics in Power Electronic, as a multidisciplinary field, we will discuss power electronics circuits, extraction of transfer functions in Continuous and discontinuous conduction mode, voltage and current control of power converters, design of input/output filters to meet Electro Magnetic Interference specifications, layout of power electronics circuits and put this knowledge in a very practical context. Prerequisites: EE 153/253
EE 292H	Engineering, Entrepreneurship & Climate Change		X	The purpose of this seminar series course is to help students and professionals develop the tools to apply the engineering and entrepreneurial mindset to problems that stem from climate change, in order to consider and evaluate possible stabilizing, remedial and adaptive approaches. This course is not a crash course on climate change or policy. Instead we will focus on learning about and discussing the climate problems that seem most tractable to these approaches. Each week Dr. Field and/or a guest speaker will lead a short warm-up discussion/activity and then deliver a talk in his/her area of expertise. We'll wrap up with small-group and full-class discussions of related challenges/opportunities and possible engineering-oriented solutions. Class members are asked to do background reading before each class, to submit a question before each lecture, and to do in-class brainstorming. May be repeated for credit
EE 292T	SmartGrids and Advanced Power Systems Seminar (Same as CEE 272T)		X	A series of seminar and lectures focused on power engineering. Renowned researchers from universities and national labs will deliver bi-weekly seminars on the state of the art of power system engineering. Seminar topics may include: power system analysis and simulation, control and stability, new market mechanisms, computation challenges and solutions, detection and estimation, and the role of communications in the grid. The instructors will cover relevant background materials in the in-between weeks. The seminars are planned to continue throughout the next academic year, so the course may be repeated for credit
EE 293A	Solar Cells, Fuel Cells, and Batteries: Materials for the Energy Solution (Same as ENERGY 293A, MATSCI 156, MATSCI 256)		X	Operating principles and applications of emerging technological solutions to the energy demands of the world. The scale of global energy usage and requirements for possible solutions. Basic physics and chemistry of solar cells, fuel cells, and batteries. Performance issues, including economics, from the ideal device to the installed system. The promise of materials research for providing next generation solutions. Undergraduates register in 156 for 4 units; graduates register in 256 for 3 units.
EE 308	Advanced Circuit Techniques	X		Design of advanced analog circuits at the system level, including switching power converters, amplitude-stabilized and frequency-stabilized oscillators, voltage references and regulators, power amplifiers and buffers, sample-and-hold circuits, and application-specific op-amp compensation. Approaches for finding creative design solutions to problems with difficult specifications and hard requirements. Emphasis on feedback circuit techniques, design-oriented thinking, and hands-on experience with modern analog building blocks. Several designs will be built and evaluated, along with associated laboratory projects. Prerequisite: EE 251 or EE 314A.

EE 320	Nanoelectronics	X		This course covers the device physics and operation principles of nanoelectronic devices, with a focus on devices for energy-efficient computation. Topics covered include devices based on new nanomaterials such as carbon nanotubes, semiconductor nanowires, and 2D layered materials such as graphene; non-FET based devices such as nanoelectromechanical (NEM) relay, single electron transistors (SET) and resonant tunneling diodes (RTD); as well as FET-based devices such as tunnel FET. Devices targeted for both logic and memory applications are covered.
EE 323	Energy in Electronics	X		This course examines energy in modern nanoelectronics, from fundamentals to system-level issues. Topics include fundamental aspects like energy transfer through electrons and phonons, ballistic limits of current and heat, meso- to macroscale mobility and thermal conductivity. The course also examines applied topics including power dissipation in nanoscale devices (FinFETs, phase-change memory, nanowires, graphene, nanotubes), circuit leakage, thermal breakdown, thermometry, heat sinks, and thermal challenges in densely integrated systems. Recommended: EE 216 or equivalent
EE 392B	Industrial Internet of Things	X		The seminar will feature guest lectures from the industry to discuss the state of the affairs in the Industrial Internet of Things (IIoT) with emphasis on existing and new Data Science, analytics, and Big Data applications. The class will address several verticals. One of them is electrical power industry, which is undergoing transition to renewables and distributed generation. Another one is aerospace industry including airlines and equipment vendors. Other verticals are oil and gas, data centers, and semiconductor manufacturing.
EE 402A	Topics in International Technology Management		X	Theme for Autumn 2015 is "International Partnerships for Advanced Intelligent Systems." This series features distinguished speakers from industry and government who are involved with international R&D projects in areas such as IIoT (Industrial Internet of Things), autonomous vehicles and other robotics, smart medical devices and services, and next generation energy and transportation systems. The focus is on projects involving at least one Asia-based partner. Please see syllabus for specific requirements, which may differ from those of other seminars at Stanford.
EMED 235	Wilderness Leadership and Mentorship Skills for Medical Students	X		For MD/Master of Medicine wilderness pre-orientation trip (SWEAT) leaders. Training to engage with and prepare incoming first-year medical students for the rigors of medical school. Topics include: fundamentals of wilderness survival, wilderness equipment use, wilderness first aid, camping, outdoor leadership, mentorship, team building, improvisation, risk management, cultural competency, professionalism as a physician, reflection and resiliency, first-year curriculum, stress management and coping. Guest lectures from Stanford faculty, emergency medicine physicians, National Outdoor Leadership School wilderness instructors, learning strategy specialists, and mentorship development specialists
ENERGY 101	Energy and the Environment (Same as EARTHSYS 101)		X	Energy use in modern society and the consequences of current and future energy use patterns. Case studies illustrate resource estimation, engineering analysis of energy systems, and options for managing carbon emissions. Focus is on energy definitions, use patterns, resource estimation, pollution.
ENERGY 101A	Energizing California		X	A weekend field trip featuring renewable and nonrenewable energy installations in Northern California. Tour geothermal, bioenergy, and natural gas field sites with expert guides from the Department of Energy Resources Engineering.
ENERGY 102	Fundamentals of Renewable Power (Same as EARTHSYS 102)		X	Do you want a much better understanding of renewable power technologies? Did you know that wind and solar are the fastest growing forms of electricity generation? Are you interested in hearing about the most recent, and future, designs for green power? Do you want to understand what limits power extraction from renewable resources and how current designs could be improved? This course dives deep into these and related issues for wind, solar, biomass, geothermal, tidal and wave power technologies. We welcome all student, from non-majors to MBAs and grad students. If you are potentially interested in an energy or environmental related major, this course is particularly useful.
ENERGY 104	Sustainable Energy for 9 Billion		X	This course explores the transition to a sustainable energy system at large scales (national and global), and over long time periods (decades). Explores the drivers of global energy demand and the fundamentals of technologies that can meet this demand sustainably. Focuses on constraints affecting large-scale deployment of technologies, as well as inertial factors affecting this transition. Problems will involve modeling global energy demand, deployment rates for sustainable technologies, technological learning and economics of technical change.
ENERGY 120	Fundamentals of Petroleum Engineering (Same as ENGR 120)		X	Lectures, problems, field trip. Engineering topics in petroleum recovery; origin, discovery, and development of oil and gas. Chemical, physical, and thermodynamic properties of oil and natural gas. Material balance equations and reserve estimates using volumetric calculations. Gas laws. Single phase and multiphase flow through porous media.
ENERGY 123	When Technology Meets Reality; An In-depth Look at the Deepwater Horizon Blowout and Oil Spill		X	The Deepwater Horizon blowout and spill in April 2010 occurred on one of the most advanced deepwater drilling rigs in the world operated by one of the most experienced companies. In this course we will look at and discuss the technologies and management practices involved in deepwater drilling and discuss how an accident like this happens and what could have been done differently to avoid it. We will focus on the Horizon and also look briefly at other high profile industrial and technological accidents.
ENERGY 130	Well Log Analysis I		X	For earth scientists and engineers. Interdisciplinary, providing a practical understanding of the interpretation of well logs. Lectures, problem sets using real field examples: methods for evaluating the presence of hydrocarbons in rock formations penetrated by exploratory and development drilling. The fundamentals of all types of logs, including electric and non-electric logs.

ENERGY 153	Carbon Capture and Sequestration (Same as ENERGY 253)		X	CO2 separation from syngas and flue gas for gasification and combustion processes. Transportation of CO2 in pipelines and sequestration in deep underground geological formations. Pipeline specifications, monitoring, safety engineering, and costs for long distance transport of CO2. Comparison of options for geological sequestration in oil and gas reservoirs, deep unmineable coal beds, and saline aquifers. Life cycle analysis.
ENERGY 160	Modeling Uncertainty in the Earth Sciences	X		Whether Earth Science modeling is performed on a local, regional or global scale, for scientific or engineering purposes, uncertainty is inherently present due to lack of data and lack of understanding of the underlying phenomena. This course highlights the various issues, techniques and practical tools available for modeling uncertainty of complex Earth systems as well as the impact uncertainty has on practical decisions for geo-engineering problems. The course focuses on practical breadth rather than theoretical depth. Topics covered are: the process of building models, sources of uncertainty, probabilistic techniques, spatial data analysis and geostatistics, grid and scale, spatio-temporal uncertainty, visualizing uncertainty in large dimensions, Monte Carlo simulation, sensitivity analysis, reducing uncertainty with data, value of information. Applications to both local (reservoir, aquifer) and global (climate) are covered through literature study. Extensive software use with SGEMS.
ENERGY 167	Engineering Valuation and Appraisal of Oil and Gas Wells, Facilities, and Properties (Same as ENERGY 267)	X		Appraisal of development and remedial work on oil and gas wells; appraisal of producing properties; estimation of productive capacity, reserves; operating costs, depletion, and depreciation; value of future profits, taxation, fair market value; original or guided research problems on economic topics with report.
ENERGY 175	Well Test Analysis		X	Lectures, problems. Application of solutions of unsteady flow in porous media to transient pressure analysis of oil, gas, water, and geothermal wells. Pressure buildup analysis and drawdown. Design of well tests. Computer-aided interpretation.
ENERGY 199	Senior Project and Seminar in Energy Resources	X		Individual or group capstone project in Energy Resources Engineering. Emphasis is on report preparation. May be repeated for credit.
ENERGY 203	The Energy Transformation Collaborative		X	Solving the global energy challenge will require the creation and successful scale-up of hundreds of new ventures. This project-based course provides a launchpad for the development and creation of transformational energy ventures and innovation models. Interdisciplinary teams will research, analyze, and develop detailed launch plans for high-impact opportunities in the context of the new energy venture development framework offered in this course.
ENERGY 204	Achieving Universal Energy Access by 2030: Can it be done?		X	Today 1.2 billion people have no access to electricity; many more don't have power that is reliable. Activities the developed world counts on for economic growth are severely limited where there isn't reliable electricity. Cost reductions in distributed, renewable energy generation and battery storage technologies are creating opportunities to bring affordable power to communities that have never had it. This course will examine what will need to be in place so that electricity can reach everyone by 2030.
ENERGY 214	The Global Price of Oil		X	Understanding the current and future price of oil requires the synthesis of geologic, engineering, financial, geopolitical, and macroeconomic information. In this seminar, we will build a global supply curve for petroleum by studying the marginal and full-cycle production costs for each of the major resource categories. We will study how reserve classification varies globally, and how global petroleum resources and reserves have changed and are likely to change over time. We will further investigate how the time lag between resource discovery, project sanctioning, and full production will affect future supply. Finally, we will study the elasticity of oil demand and how that demand is likely to change over time as the developing world gets richer and as competition from other energy sources increases.
ENERGY 216	Entrepreneurship in Energy		X	The combined forces of climate change, technological development, and geopolitics are disrupting the energy industry, yet the competitiveness and regulated nature of the mature markets for fuel, power, and materials have created meaningful barriers to entry for startup companies. In this case based course, students will study real energy startups to understand what challenges they have overcome and continue to face. Each week, the course will focus on a different company and the founder or CEO of that company will present. Topics will include advanced battery technologies, photovoltaic manufacturing, solar and wind project development, oil & gas exploration & production, advanced biofuels, electric vehicles, distributed power generation, and financing energy startups.
ENERGY 217	Research Seminar: Energy Development in the Emerging Economy		X	Through this research project, students will dive into and gain firsthand experience on evaluating the efficacy of a portfolio of 34 energy technology start-up projects in emerging economies that encompasses a range of regions, energy sectors, and technologies. Student's will learn from each project's unique experiences, and gather critical data that may help support the success of future similar endeavors. Some questions students will be looking to answer include (1) Was the project able to accomplish its goal(s)? (2) Are there common success factors or similar roadblocks? (3) Is the technology and/or solution still effective and operational? Prerequisite: submit survey <a href="https://precourt.typeform.com/to/NdtU0Z">https://precourt.typeform.com/to/NdtU0Z</a> and permission of instructor.
ENERGY 221	Fundamentals of Multiphase Flow (Same as ENERGY 121)		X	Multiphase flow in porous media. Wettability, capillary pressure, imbibition and drainage, Leverett J-function, transition zone, vertical equilibrium. Relative permeabilities, Darcy's law for multiphase flow, fractional flow equation, effects of gravity, Buckley-Leverett theory, recovery predictions, volumetric linear scaling, JBN and Jones-Rozelle determination of relative permeability. Frontal advance equation, Buckley-Leverett equation as frontal advance solution, tracers in multiphase flow, adsorption, three-phase relative permeabilities.

ENERGY 222	Advanced Reservoir Engineering		X	Lectures, problems. General flow equations, tensor permeabilities, steady state radial flow, skin, and succession of steady states. Injectivity during fill-up of a depleted reservoir, injectivity for liquid-filled reservoirs. Flow potential and gravity forces, coning. Displacements in layered reservoirs. Transient radial flow equation, primary drainage of a cylindrical reservoir, line source solution, pseudo-steady state. May be repeated for credit.
ENERGY 223	Reservoir Simulation		X	Fundamentals of petroleum reservoir simulation. Equations for multicomponent, multiphase flow between gridblocks comprising a petroleum reservoir. Relationships between black-oil and compositional models. Techniques for developing black-oil, compositional, thermal, and dual-porosity models. Practical considerations in the use of <del>simulators for predicting reservoir performance. Class project.</del>
ENERGY 224	Advanced Reservoir Simulation		X	Topics include modeling of complex wells, coupling of surface facilities, compositional modeling, dual porosity models, treatment of full tensor permeability and grid nonorthogonality, local grid refinement, higher order methods, streamline simulation, upscaling, algebraic multigrid solvers, unstructured grid solvers, history matching, other selected <del>topics.</del>
ENERGY 227	Enhanced Oil Recovery	X		The physics, theories, and methods of evaluating chemical, miscible, and thermal enhanced oil recovery projects. Existing methods and screening techniques, and analytical and simulation based means of evaluating project effectiveness. Dispersion-convection-adsorption equations, coupled heat, and mass balances and phase behavior <del>provide requisite building blocks for evaluation.</del>
ENERGY 230	Advanced Topics in Well Logging		X	State of the art tools and analyses; the technology, rock physical basis, and applications of each measurement. Hands-on computer-based analyses illustrate instructional material. Guest speakers on formation evaluation topics. Prerequisites: 130 or equivalent; basic well logging; and standard practice and application of electric well logs.
ENERGY 251	Thermodynamics of Equilibria		X	Lectures, problems. The volumetric behavior of fluids at high pressure. Equation of state representation of volumetric behavior. Thermodynamic functions and conditions of equilibrium, Gibbs and Helmholtz energy, chemical potential, fugacity. Phase diagrams for binary and multicomponent systems. Calculation of phase compositions from volumetric behavior for multicomponent mixtures. Experimental techniques for phase-equilibrium measurements. May be <del>repeated for credit.</del>
ENERGY 253	Carbon Capture and Sequestration (Same as ENERGY 153)		X	CO2 separation from syngas and flue gas for gasification and combustion processes. Transportation of CO2 in pipelines and sequestration in deep underground geological formations. Pipeline specifications, monitoring, safety engineering, and costs for long distance transport of CO2. Comparison of options for geological sequestration in oil and gas <del>reservoirs, deep unmineable coal beds, and saline aquifers. Life cycle analysis.</del>
ENERGY 269	Geothermal Reservoir Engineering	X		Conceptual models of heat and mass flows within geothermal reservoirs. The fundamentals of fluid/heat flow in porous media; convective/conductive regimes, dispersion of solutes, reactions in porous media, stability of fluid interfaces, liquid and vapor flows. Interpretation of geochemical, geological, and well data to determine reservoir <del>properties/characteristics. Geothermal plants and the integrated geothermal system.</del>
ENERGY 271	Energy Infrastructure, Technology and Economics (Same as ENERGY 171)	X		Oil and gas represents more than 50% of global primary energy. In delivering energy at scale, the industry has developed global infrastructure with supporting technology that gives it enormous advantages in energy markets; this course explores how the oil and gas industry operates. From the perspective of these established systems and technologies, we will look at the complexity of energy systems, and will consider how installed infrastructure enables technology development and deployment, impacts energy supply, and how existing infrastructure and capital invested <del>in fossil energy impacts renewable energy development.</del>
ENERGY 274	Complex Analysis for Practical Engineering	X		Complex analysis is closely related to potential theory, appearing in a variety of engineering disciplines, including flow dynamics, electrostatics, heat conduction and gravity fields. This course is devoted to explaining the fundamentals of complex analysis and instructing on how to develop mathematical tools to solve engineering problems in potential theory. Individual topics are lectured with motivating problems, so that students can understand why these subjects need to be covered and how these are applied to practical engineering problems.
ENERGY 281	Applied Mathematics in Reservoir Engineering	X		The philosophy of the solution of engineering problems. Methods of solution of partial differential equations: Laplace transforms, Fourier transforms, wavelet transforms, Green's functions, and boundary element methods. <del>Prerequisites: CME 204 or MATH 131, and consent of instructor.</del>
ENERGY 282	Chemical Kinetics of Fossil Fuel Creation and Utilization	X		Chemical kinetics are an integral part of optimizing recovery of fossil fuels. After reviewing the genesis of various kinds of fossil fuels and the history of their use, the course describes the molecular structure of the various types and how that influences their pyrolysis kinetics. Methods for deriving reliable kinetics are covered, including how to determine which phenomenological models are appropriate. Applications discussed are petroleum formation, oil shale retorting, <del>heavy oil upgrading, and coal liquefaction.</del>
ENERGY 291	Optimization of Energy Systems (Same as ENERGY 191)	X		Introductory mathematical programming and optimization using examples from energy industries. Emphasis on problem formulation and solving, secondary coverage of algorithms. Problem topics include optimization of energy investment, production, and transportation; uncertain and intermittent energy resources; energy storage; efficient energy production and conversion. Methods include linear and nonlinear optimization, as well as multi-objective and goal programming. Tools include Microsoft Excel and AMPL mathematical programming language. Prerequisites: MATH 20, 41, or MATH 51, or consent of instructor. Programming experience helpful (e.g., CS 106A, CS 106B).
ENERGY 293B	Fundamentals of Energy Processes (Same as EE 293B)		X	For seniors and graduate students. Covers scientific and engineering fundamentals of renewable energy processes involving heat. Thermodynamics, heat engines, solar thermal, geothermal, biomass.

ENERGY 293C	Energy from Wind and Water Currents		X	This course focuses on the extraction of energy from wind, waves and tides. The emphasis in the course is technical leading to a solid understanding of established extraction systems and discussion of promising new technologies. We will also cover resource planning and production optimization through observations and computer simulations. The course includes at least one weekend field trip, and may include experiments in wind tunnel and/or flume. Prerequisites: CEE176B or EE293B, programming experience, understanding of fluid mechanics, electrical systems, and engineering optimization.
ENERGY 301	The Energy Seminar (Same as CEE 301, MS&E 494)		X	Interdisciplinary exploration of current energy challenges and opportunities, with talks by faculty, visitors, and students.
ENGLISH 12A	Introduction to English III: Introduction to African American Literature (Same as AFRICAAM 43, AMSTUD 12A)	X		In his bold study, <i>What Was African American Literature?</i> , Kenneth Warren defines African American literature as a late nineteenth- to mid-twentieth-century response to the nation's Jim Crow segregated order. But in the aftermath of the Jim Crow era and the Civil Rights movement, can critics still speak, coherently, of "African American literature"? And how does this political conception of African American literary production compare with accounts grounded in black language and culture? Taking up Warren's intervention, this course will explore African American literature from its earliest manifestations in the spirituals and slave narratives to texts composed at the height of desegregation and decolonization struggles at mid-century and beyond.
ENGLISH 146C	Hemingway, Hurston, Faulkner, and Fitzgerald (Same as AMSTUD 146C)	X		While Hemingway and Fitzgerald were flirting with the expatriate avant-garde in Europe, Hurston and Faulkner were performing anthropological field-work in the local cultures of the American South. Focus on the tremendous diversity of concerns and styles of four writers who marked America's coming-of-age as a literary nation with their multifarious experiments in representing the regional and the global, the racial and the cosmopolitan, the macho and the feminist, the decadent and the impoverished.
ENGLISH 186	Tales of Three Cities: New York, Chicago, Los Angeles (Same as AMSTUD 186)	X		How urban form and experience shape literary texts and how literary texts participate in the creation of place, through the literature of three American cities as they ascended to cultural and iconographical prominence: New York in the early to mid 19th century; Chicago in the late 19th and early 20th centuries; and Los Angeles in the mid to late 20th century.
ENGR 20	Introduction to Chemical Engineering (Same as CHEMENG 20)	X		Overview of chemical engineering through discussion and engineering analysis of physical and chemical processes. Topics: overall staged separations, material and energy balances, concepts of rate processes, energy and mass transport, and kinetics of chemical reactions. Applications of these concepts to areas of current technological importance: biotechnology, energy, production of chemicals, materials processing, and purification. Prerequisite: CHEM 31.
ENGR 25E	Energy: Chemical Transformations for Production, Storage, and Use (Same as CHEMENG 25E)	X		An introduction and overview to the challenges and opportunities of energy supply and consumption. Emphasis on energy technologies where chemistry and engineering play key roles. Review of energy fundamentals along with historical energy perspectives and current energy production technologies. In depth analyses of solar thermal systems, biofuels, photovoltaics and electrochemical devices (batteries and fuel cells).
ENGR 30	Engineering Thermodynamics	X		The basic principles of thermodynamics are introduced in this course. Concepts of energy and entropy from elementary considerations of the microscopic nature of matter are discussed. The principles are applied in thermodynamic analyses directed towards understanding the performances of engineering systems. Methods and problems cover socially responsible economic generation and utilization of energy in central power generation plants, solar systems, refrigeration devices, and automobile, jet and gas-turbine engines.
ENGR 50E	Introduction to Materials Science, Energy Emphasis	X		Materials structure, bonding and atomic arrangements leading to their properties and applications. Topics include electronic, thermal and mechanical behavior; emphasizing energy related materials and challenges.
ENGR 80	Introduction to Bioengineering (Engineering Living Matter) (Same as BIOE 80)	X		Students completing BIOE.80 should have a working understanding for how to approach the systematic engineering of living systems to benefit all people and the planet. Our main goals are (1) to help students learn ways of thinking about engineering living matter and (2) to empower students to explore the broader ramifications of engineering life. Specific concepts and skills covered include but are not limited to: capacities of natural life on Earth; scope of the existing human-directed bioeconomy; deconstructing complicated problems; reaction & diffusion systems; microbial human anatomy; conceptualizing the engineering of biology; how atoms can be organized to make molecules; how to print DNA from scratch; programming genetic sensors, logic, & actuators; biology beyond molecules (photons, electrons, etc.); what constraints limit what life can do?; what will be the major health challenges in 2030?; how does what we want shape bioengineering?; who should choose and realize various competing bioengineering futures?
ENGR 90	Environmental Science and Technology (Same as CEE 70)		X	Introduction to environmental quality and the technical background necessary for understanding environmental issues, controlling environmental degradation, and preserving air and water quality. Material balance concepts for tracking substances in the environmental and engineering systems.
ENGR 119	Community Engagement Preparation Seminar (Same as ENGR 219)	X		This seminar is designed for engineering students who have already committed to an experiential learning program working directly with a community partner on a project of mutual benefit. This seminar is targeted at students participating in the Summer Service Learning Program offered through Stanford's Global Engineering Program.

ENGR 131	Ethical Issues in Engineering	X		Moral rights and responsibilities of engineers in relation to society, employers, colleagues, and clients; cost-benefit-risk analysis, safety, and informed consent; the ethics of whistle blowing; ethical conflicts of engineers as expert witnesses, consultants, and managers; ethical issues in engineering design, manufacturing, and operations; ethical issues arising from engineering work in foreign countries; and ethical implications of the social and environmental contexts of contemporary engineering. Case studies, guest practitioners, and field research. Limited enrollment.
ENVRES 220	The Social Ocean: Ocean Conservation, Management, and Policy		X	This interdisciplinary seminar examines current ocean issues and ideas through a series of readings, discussions, and guest lecturer presentations of seminal works about the complex relationships of human beings to the marine world. Through the lenses offered by several classic readings, we will examine and reinterpret the challenges of fisheries collapse, climate change, shipping, marine spatial planning, biodiversity conservation, and the management of land-sea interactions. Though the seminar is open to all undergraduate and graduate students, our course is designed especially for those with a particular interest in studying and solving key issues of ocean policy and management, from coastal adaption to fisheries management to cumulative impacts assessments. In addition to this interest, students must be willing to take the time to dig deeper into the foundations of environmental thinking about the relationship of human beings and the sea.
ENVRES 221	New Frontiers and Opportunities in Sustainability		X	Interdisciplinary exploration of how companies, government and non-profit organizations address some of the world's most significant environmental & resource sustainability challenges. Each week we will explore with an experienced sustainability practitioner new frontiers and opportunities in clean tech, policy, energy, transportation, consumer goods, agriculture, food, and sustainable built environments.
ENVRES 225	E-IPER Current Topics Seminar	X		For E-IPER Ph.D and Joint M.S. students only. Weekly presentations of E-IPER students' research and other program-related projects. Occasional guest speakers. Individual or team presentation, active participation, and regular attendance required for credit. May be taken for credit a maximum of two times.
ENVRES 240	Environmental Decision-Making and Risk Perception		X	Mobilizing successful conservation efforts to mitigate climate change and preserve both local and global ecosystems requires a new way of thinking. This course will investigate the barriers to pro-environmental behavior and the heuristics and biases that cloud our ability to respond effectively to environmental problems, using insights from behavioral economics, neuroeconomics, and environmental risk perception. Emphasis on interdisciplinary applications of recent research, and implications for environmental policymaking and persuasive messaging.
ENVRES 280	Introduction to Environmental Science		X	For E-IPER Joint M.S. students only. This course functions as a gateway for E-IPER Joint M.S. students to learn about the variety of environmental science conducted by the program's affiliated faculty. Topics include oceans, green chemistry, water policy, energy, and others. Students engage in problem solving related to the application of science to business, law, and the conservation of natural resources.
ENVRES 290	Capstone Project Seminar in Environment and Resources		X	Required for and limited to E-IPER Joint M.S. students. Propose, conduct and publicly present final individual or team projects demonstrating the integration of professional (M.B.A., J.D., or M.D.) and M.S. in Environment and Resources degrees. Presentation and submission of final product required. 3 total units required; can all be taken during one quarter or divided over two sequential quarters.
ENVRES 300	Introduction to Resource, Energy and Environmental Economics		X	Examination of environmental, energy and natural resource management problems through the lens of economics, with an emphasis on hands-on practical problem-solving. Topics include market failure, cost-benefit analysis, finance, risk & uncertainty, non-market valuation, regulation, green accounting, rent, renewable resources, exhaustible resources, including energy, and biodiversity. Prerequisite: proficiency in multivariate calculus. Knowledge of basic microeconomics helpful but not essential. Open only to E-IPER PhD students.
ENVRES 315	Environmental Research Design Seminar		X	Required core course for first year E-IPER Ph.D. students; optional for Joint M.S. students; other graduate students with instructor's permission. Series of faculty presentations and student-led discussions on interdisciplinary research design as exemplars of the research design theories discussed in ENVRES 320. Designing Environmental Research. Topics parallel the ENVRES 320 syllabus. Corequisite: ENVRES 320.
ENVRES 320	Designing Environmental Research		X	Required core course restricted to first year E-IPER Ph.D. students. Research design options for causal inference in environmentally related research. Major philosophies of knowledge and how they relate to research objectives and design choices. Identification of critical elements within a broad range of research designs. Evaluation of the types of research questions for which different designs are suited, emphasizing fit between objectives, design, methods, and argument. Development of individual research design proposals, including description and justification understandable to a non-specialist.
ENVRES 330	Research Approaches for Environmental Problem Solving	X		Required core course restricted to first year E-IPER Ph.D. students. How to develop and implement interdisciplinary research in environment and resources. Assignments include development of research questions, a preliminary literature review, and a summer funding proposal. Course is structured on peer critique and student presentations of work in progress.
ENVRES 340	E-IPER PhD Writing Seminar	X		Restricted to second year E-IPER PHD students only. Actively pursue one or more writing goals relevant to this stage in their graduate studies in a structured setting. Set specific writing goals, create and follow a plan for reaching these goals, and receive substantive feedback on their written products from their peers. Examples of writing products include, but are not limited to, the student's dissertation proposal, E-IPER Fields of Inquiry essay, a literature review, or a grant or fellowship application. By the end of the course, students are expected to have completed or have made substantial progress toward their writing goal.

ENVRES 380	Collaborating with the Future: Launching Large Scale Sustainable Transformations		X	This project-based d.school class combines Design Thinking with Systems Thinking, with the goal of designing interventions to large scale, complex and systemic challenges. This class draws from System theory, Behavioral Sciences, elements of Diffusion Theory, and a methodology for scaled transformation. Tools and theories introduced in class will be used to structure large-scale transformations that simultaneously create value on environmental, societal, and economic fronts. This is a project-based class involving team-based, real world challenges that are all complex and scaled. Primarily meant for Graduate Students (especially qualified/motivated Seniors will be considered). Admission to the class is through an application process through the d.school. Please find instructions and applications at the <a href="#">d.school class applications website</a> .
ESS 8	The Oceans: An Introduction to the Marine Environment (Same as EARTHSYS 8)		X	The course will provide a basic understanding of how the ocean functions as a suite of interconnected ecosystems, both naturally and under the influence of human activities. Emphasis is on the interactions between the physical and chemical environment and the dominant organisms of each ecosystem. The types of ecosystems discussed include coral reefs, deep-sea hydrothermal vents, coastal upwelling systems, blue-water oceans, estuaries, and near-shore dead zones. Lectures, multimedia presentations, group activities, and tide-pooling day trip.
ESS 46N	Exploring the Critical Interface between the Land and Monterey Bay: Elkhorn Slough (Same as EARTHSYS 46N)		X	Preference to freshmen. Field trips to sites in the Elkhorn Slough, a small agriculturally impacted estuary that opens into Monterey Bay, a model ecosystem for understanding the complexity of estuaries, and one of California's last remaining coastal wetlands. Readings include Jane Caffrey's Changes in a California Estuary: A Profile of Elkhorn Slough. Basics of biogeochemistry, microbiology, oceanography, ecology, pollution, and environmental management.
ESS 107	Control of Nature (Same as EARTHSYS 107)		X	Think controlling the earth's climate is science fiction? It is when you watch Snowpiercer or Dune, but scientists are already devising geoengineering schemes to slow climate change. Will we ever resurrect the woolly mammoth or even a T. Rex (think Jurassic Park)? Based on current research, that day will come in your lifetime. Who gets to decide what species to save? And more generally, what scientific and ethical principles should guide our decisions to control nature? In this course, we will examine the science behind ways that people alter and engineer the earth, critically examining the positive and negative consequences. We'll explore these issues first through popular movies and books and then, more substantively, in scientific research.
ESS 135	Community Leadership	X		Offered through Residential Education to residents of Castano House, Manzanita Park. Topics include: emotional intelligence, leadership styles, listening, facilitating meetings, group dynamics and motivation, finding purpose, fostering resilience. Students will lead discussions on personal development, relationships, risky behaviors, race, <a href="#">ethnicity, spirituality, integrity</a> .
ESS 148	Introduction to Physical Oceanography (Same as EARTHSYS 164, CEE 162D, CEE 262D)		X	The dynamic basis of oceanography. Topics: physical environment; conservation equations for salt, heat, and momentum; geostrophic flows; wind-driven flows; the Gulf Stream; equatorial dynamics and ENSO; thermohaline <a href="#">circulation of the deep oceans; and tides. Prerequisite: PHYSICS 41 (formerly 53).</a>
ESS 151	Biological Oceanography (Same as EARTHSYS 151, EARTHSYS 251, ESS 251)	X		Required for Earth Systems students in the oceans track. Interdisciplinary look at how oceanic environments control the form and function of marine life. Topics include distributions of planktonic production and abundance, nutrient cycling, the role of ocean biology in the climate system, expected effects of climate changes on ocean biology. Local weekend field trips. Designed to be taken concurrently with Marine Chemistry (EES/ EARTHSYS 152/252).
ESS 155	Science of Soils (Same as EARTHSYS 155)	X		Physical, chemical, and biological processes within soil systems. Emphasis is on factors governing nutrient availability, plant growth and production, land-resource management, and pollution within soils. How to classify soils and assess nutrient cycling and contaminant fate. Recommended: introductory chemistry and biology.
ESS 162	Remote Sensing of Land (Same as EARTHSYS 242, EARTHSYS 142, ESS 262)	X		The use of satellite remote sensing to monitor land use and land cover, with emphasis on terrestrial changes. Topics include pre-processing data, biophysical properties of vegetation observable by satellite, accuracy assessment of maps derived from remote sensing, and methodologies to detect changes such as urbanization, deforestation, vegetation <a href="#">health, and wildfires.</a>
ESS 163	Demography and Life History Theory (Same as ESS 363)	X		Life history theory is the branch of evolutionary biology that attempts to understand patterns of investment in growth, reproduction, and survival across the life cycle. It is the theory that explains the major transitions that mark individual organisms' life cycles from conception to death. In this class, we will focus on the central themes of life history theory and how they relate to specific problems of the human life cycle. In addition to the classic questions of life history theory (e.g., evolution of reproductive effort, size vs. quality, etc.), we will discuss some peculiar issues that relate specifically to humans. In particular, we will explore the intersection of life history theory and more classical economic approaches to decision theory and rational choice. This will include an exploration of the evolution of economic transfers and their implications for demographic transitions, ecological resilience, and the consumption of natural resources. This discussion will explore how an understanding of life history theory might help in promoting investments in future welfare or developing policies that promote sustainability.
ESS 208	Topics in Geobiology (Same as GS 208)	X		Reading and discussion of classic and recent papers in the field of Geobiology. Co-evolution of Earth and life; critical intervals of environmental and biological change; geomicrobiology; paleobiology; global biogeochemical cycles; scaling of geobiological processes in space and time.

ESS 210	Techniques in Environmental Microbiology	X		Fundamentals and application of laboratory techniques to study the diversity and activity of microorganisms in environmental samples, including soil, sediment, and water. Emphasis is on culture-independent approaches, including epifluorescence microscopy, extraction and analysis of major biomolecules (DNA, RNA, protein, lipids), stable isotope probing, and metabolic rate measurements. Format will include lectures, laboratory exercises, and discussions. Students will learn how to collect, analyze, and understand common and cutting-edge datasets in environmental microbiology.
ESS 211	Fundamentals of Modeling (Same as EARTHSYS 211)		X	Simulation models are a powerful tool for environmental research, if used properly. The major concepts and techniques for building and evaluating models. Topics include model calibration, model selection, uncertainty and sensitivity analysis, and Monte Carlo and bootstrap methods. Emphasis is on gaining hands-on experience using the R programming language. Prerequisite: Basic knowledge of statistics.
ESS 220	Physical Hydrogeology (Same as CEE 260A)	X		(Formerly GES 230.) Theory of underground water occurrence and flow, analysis of field data and aquifer tests, geologic groundwater environments, solution of field problems, and groundwater modeling. Introduction to groundwater contaminant transport and unsaturated flow. Lab. Prerequisite: elementary calculus.
ESS 221	Contaminant Hydrogeology and Reactive Transport (Same as GS 225, CEE 260C)		X	For earth scientists and engineers. Environmental, geologic, and water resource problems involving migration of contaminated groundwater through porous media and associated biogeochemical and fluid-rock reactions. Conceptual and quantitative treatment of advective-dispersive transport with reacting solutes. Predictive models of contaminant behavior controlled by local equilibrium and kinetics. Modern methods of contaminant transport simulation and reactive transport modeling using geochemical transport software. Some Matlab programming / program modification required. Prerequisite: Physical Hydrogeology ESS 220 / CEE 260A (Gorelick) or equivalent. Recommended: course work in environmental chemistry or geochemistry (e.g., one or more of the following: ESS 155, ESS 156/256 GS 90, GS 170/270, GS 171, CEE 177 or CEE 270).
ESS 232	Evolution of Earth Systems (Same as ESS 132, EARTHSYS 232, EARTHSYS 132)		X	This course examines biogeochemical cycles and how they developed through the interaction between the atmosphere, hydrosphere, biosphere, and lithosphere. Emphasis is on the long-term carbon cycle and how it is connected to other biogeochemical cycles on Earth. The course consists of lectures, discussion of research papers, and quantitative modeling of biogeochemical cycles. Students produce a model on some aspect of the cycles discussed in this course. Grades based on class interaction, student presentations, and the modeling project.
ESS 240	Advanced Oceanography	X		For upper-division undergraduates and graduate students in the earth, biologic, and environmental sciences. Topical issues in marine science/oceanography. Topics vary each year following or anticipating research trends in oceanographic research. Focus is on links between the circulation and physics of the ocean with climate in the N. Pacific region, and marine ecologic responses. Participation by marine scientists from research groups and organizations including the Monterey Bay Aquarium Research Institute.
ESS 244	Marine Ecosystem Modeling	X		This course will provide the practical background necessary to construct and implement a 2-dimensional (space and time) numerical model of a simple marine ecosystem. Instruction on computer programming, model design and parameterization, and model evaluation will be provided. Throughout the 10-week course, each student will develop and refine their own multi-component marine ecosystem model.
ESS 246A	Atmosphere, Ocean, and Climate Dynamics: The Atmospheric Circulation (Same as ESS 146A, EARTHSYS 146A, EARTHSYS 246A, GEOPHYS 146A, GEOPHYS 246A, CEE 2611, CEE 1611)		X	Introduction to the physics governing the circulation of the atmosphere and ocean and their control on climate with emphasis on the atmospheric circulation. Topics include the global energy balance, the greenhouse effect, the vertical and meridional structure of the atmosphere, dry and moist convection, the equations of motion for the atmosphere and ocean, including the effects of rotation, and the poleward transport of heat by the large-scale atmospheric circulation and storm systems. Prerequisites: MATH 51 or CME100 and PHYSICS 41.
ESS 252	Marine Chemistry (Same as EARTHSYS 152, EARTHSYS 252, ESS 152)	X		Introduction to the interdisciplinary knowledge and skills required to critically evaluate problems in marine chemistry and related disciplines. Physical, chemical, and biological processes that determine the chemical composition of seawater. Air-sea gas exchange, carbonate chemistry, and chemical equilibria, nutrient and trace element cycling, particle reactivity, sediment chemistry, and diagenesis. Examination of chemical tracers of mixing and circulation and feedbacks of ocean processes on atmospheric chemistry and climate. Designed to be taken concurrently with Biological Oceanography (FESS/ EARTHSYS 151/251)
ESS 258	Geomicrobiology (Same as ESS 158, EARTHSYS 158, EARTHSYS 258)	X		How microorganisms shape the geochemistry of the Earth's crust including oceans, lakes, estuaries, subsurface environments, sediments, soils, mineral deposits, and rocks. Topics include mineral formation and dissolution; biogeochemical cycling of elements (carbon, nitrogen, sulfur, and metals); geochemical and mineralogical controls on microbial activity, diversity, and evolution; life in extreme environments; and the application of new techniques to geomicrobial systems.
ESS 265	Advanced Geographic Information Systems (Same as ESS 165)	X		Building on the Fundamentals of Geographic Information Systems course, this class delves deeper into geospatial analysis and mapping techniques. The class is heavily project-based and students are encouraged to bring their own research questions. Topics include topographic analysis, interpolation, spatial statistics, network analysis, and scripting using Python and Arcpy. All students are required to attend a weekly lab. ESS 164 or equivalent is a prerequisite.
ESS 280	Principles and Practices of Sustainable Agriculture (Same as EARTHSYS 180)		X	Field-based training in ecologically sound agricultural practices at the Stanford Community Farm. Weekly lessons, field work, and group projects. Field trips to educational farms in the area. Topics include: soils, composting, irrigation techniques, IPM, basic plant anatomy and physiology, weeds, greenhouse management, and marketing.

ESS 282	Designing Educational Gardens (Same as EARTHSYS 182)	X		A project-based course emphasizing 'ways of doing 's sustainable agricultural systems based at the new Stanford Educational Farm. Students will work individually and in small groups on the design of a new educational garden and related programs for the Stanford Educational Farm. The class will meet on 6 Fridays over the course of winter quarter. Class meetings will include an introduction to designing learning gardens and affiliated programs, 3 field trips to exemplary educational gardens in the bay area that will include tours and discussions with garden educators, and work sessions for student projects
ESS 301	Topics in Earth System Science		X	Current topics, issues, and research related to interactions that link the oceans, atmosphere, land surfaces and freshwater systems. May be repeated for credit.
ESS 305	Climate Change: An Earth Systems Perspective		X	A graduate-level, seminar-style class on climate change structured around the IPCC's AR5. Significant reading load and weekly talks by a rotating roster of contributing and lead authors from the IPCC. The focus will be on the physical science basis, adaptation and impacts (working groups 1 and 2), with some material drawn from mitigation (working group 3).
ESS 306	From Freshwater to Oceans to Land Systems: An Earth System Perspective to Global Challenges	X		Within this class we will have cover Earth System processes ranging from nutrient cycles to ocean circulation. We will also address global environmental challenges of the twenty-first century that include maintaining freshwater resources, land degradation, health of our oceans, and the balance between food production and environmental degradation. Weekly readings and problem sets on specific topics will be followed by presentations of Earth System Science faculty and an in-depth class discussion. ESS first year students have priority enrollment.
ESS 322B	Seminar in Hydrogeology	X		Current topics. May be repeated for credit. Prerequisite: consent of instructor.
ETHICSOC 133	Ethics and Politics of Public Service (Same as POLISCI 133, PUBLPOL 103D, PHIL 175A, PHIL 275A, HUMBIO 178, CSRE 178, URBANST 122)	X		Ethical and political questions in public service work, including volunteering, service learning, humanitarian assistance, and public service professions such as medicine and teaching. Motives and outcomes in service work. Connections between service work and justice. Is mandatory service an oxymoron? History of public service in the U.S. Issues in crosscultural service work. Integration with the Haas Center for Public Service to connect service activities and public service aspirations with academic experiences at Stanford.
ETHICSOC 185M	Contemporary Moral Problems (Same as PHIL 72, POLISCI 134P)	X		This course addresses moral issues that play a major role in contemporary public discourse. The course aims to encourage students to consider moral problems in a reflective, systematic manner, and to equip students with skills that will enable them to do so. Questions to be addressed include: Do rich countries have an obligation to accept refugees from other parts of the world? Do such obligations conflict with the right of individuals to protect their culture? Is there anything principally wrong in the use of drones for purposes of warfare? Do we have obligations to the environment, and if so why? What is racism and what makes it wrong? And what are feminist ideals?
FEMGEN 86Q	Love as a Force for Social Justice (Same as HUMBIO 86Q)	X		Preference to sophomores. Biological, psychological, religious, social and cultural perspectives on the concept of agape love. How love is conceptualized across cultures; agape love as the basis of many religions; different kinds of love; the biology of love; love in action for social justice; the languages of love, including art, literature, music, and poetry. Emphasis is on blog writing, participation, and oral presentation.
FEMGEN 101	Introduction to Feminist, Gender, and Sexuality Studies (Same as CSRE 108, AMSTUD 107, TAPS 108)	X		Introduction to interdisciplinary approaches to gender, sexuality, queer, trans and feminist studies. Topics include the emergence of sexuality studies in the academy, social justice and new subjects, science and technology, art and activism, history, film and memory, the documentation and performance of difference, and relevant socio-economic and political formations such as work and the family. Students learn to think critically about race, gender, and sexuality from local and global perspectives.
FEMGEN 129	Critical Issues in International Women's Health (Same as HUMBIO 129)	X		Women's lives, from childhood through adolescence, reproductive years, and aging. Economic, social, and human rights factors, and the importance of women's capacities to have good health and manage their lives in the face of societal pressures and obstacles. Emphasis is on life or death issues of women's health that depend on women's capacity to exercise their human rights including maternal mortality, violence, HIV/AIDS, reproductive health, and sex trafficking. Organizations addressing these issues. A requirement of this class is participation in public blogs.
FEMGEN 141	Intersectionality and Social Movements: Gender, Race, Sexuality and Collective Organizing	X		This course explores U.S. social movements from an intersectional perspective. How is social movement emergence related to participants' identities and experiences with inequality? How are the dynamics, targets and tactics of mobilized participants related to race, class, gender, age and/or sexuality? How have social movement scholars addressed the intersectional nature of identity and community? Readings include empirical and theoretical social movement texts, and discussion topics include feminist and civil rights movements, queer/LGBT movements, Occupy Wall Street and Black Lives Matter
FEMGEN 311C	Expanding Engineering Limits: Culture, Diversity, and Gender (Same as ENGR 311C)	X		This course considers how culture shapes and impacts engineering, with a particular focus on the cultural aspects of gender that affect who becomes an engineer, what problems get solved, and the quality of solutions, design, technology, and products. We will examine engineering cultures and gender through the lens of "design thinking," which is an increasingly visible component of engineering education and practice. Design processes are determined by the designers, their disciplinary backgrounds, and the methods they use. How do the background characteristics of the designer affect products and development in innovation and research? Does gender matter? What about other characteristics of the designer? How can design thinking help to find sustainable solutions and also consider gender and diversity perspectives?

FEMGEN 363D	Feminist Theory: Thinking Through/With/About the Gendered Body (Same as ENGLISH 363D)	X		Organized around a series of case studies, this graduate feminist theory course will consider issues related to the complex relationship between sex, gender, sexuality, biological reproduction, violence, and social power. It is a core course for the PhD minor in Feminist, Gender, and Sexuality Studies. Enrollment is limited to PhD-level students.
FEMGEN 7W	Service Learning Workshop on Human Trafficking Part II	X		Prerequisite: HISTORY6W ( FEMGEN 6W). Continuation of HISTORY 6W ( FEMGEN 6W). Students will continue working on their projects with their community partners. Several class meetings and small group consultations throughout the quarter. (Cardinal Course certified by the Haas Center)
FRENCH 122	Nation in Motion: Film, Race and Immigration in Contemporary French Cinema (Same as CSRE 65, FRENCH 332)	X		Examines the current debates in France regarding national identity, secularism, and the integration of immigrants, notably from the former colonies. Confronts films' and other media's visual and discursive rhetorical strategies used to represent ethnic or religious minorities, discrimination, radicalization, terrorism, inter-racial marriages, or women's rights within immigrant communities. By embodying such themes in stories of love, hardships, or solidarity, the motion pictures make the movements and emotions inherent to immigration tangible: to what effect? Taught in English. Films in French with English subtitles. Additional paper for students enrolled in 332.
FRENCH 166	Food, Text, Music: A Multidisciplinary Lab on the Art of Feasting (Same as MUSIC 133, FRENCH 366, MUSIC 333)	X		Students cook a collection of unfamiliar recipes each week while learning about the cultural milieus in which they originated. The course focuses on the fourteenth and fifteenth centuries, a time of great banquets that brought together chefs, visual artists, poets, musicians, and dancers. Students read late-medieval cookbooks under the guidance of professional chefs, learn songs and poetry with the help of visiting performers, and delve into a burgeoning scholarly literature on food history and sensory experience. We will also study trade routes and food networks, the environmental impact of large-scale banquets, the science of food, and the politics of plenty.
FRENCH 228	Science, technology and society and the humanities in the face of the looming disaster (Same as ITALIAN 228, POLISCI 233F)	X		How STS and the Humanities can together help think out the looming catastrophes that put the future of humankind in jeopardy.
GEOPHYS 90	Earthquakes and Volcanoes (Same as EARTHSYS 113)		X	Is the "Big One" overdue in California? What kind of damage would that cause? What can we do to reduce the impact of such hazards in urban environments? Does "fracking" cause earthquakes and are we at risk? Is the United States vulnerable to a giant tsunami? The geologic record contains evidence of volcanic super eruptions throughout Earth's history. What causes these gigantic explosive eruptions, and can they be predicted in the future? This course will address these and related issues. For non-majors and potential Earth scientists. No prerequisites. More information at: <a href="https://stanford.box.com/s/tpwwqpl2ryxfty6stq8wo2j78fj06ikg">https://stanford.box.com/s/tpwwqpl2ryxfty6stq8wo2j78fj06ikg</a>
GEOPHYS 171	Tectonics Field Trip	X		Long weekend field trip to examine large-scale features in the crust. Destinations may include the San Andreas fault, Mendocino Triple Junction, Sierra Nevada, and western Basin and Range province.
GEOPHYS 190	Near-Surface Geophysics	X		Introduction to geophysical methods that can be used for imaging and characterizing groundwater systems; modeling and interpretation of the data. This Cardinal Class will be structured around solving a problem currently faced by a community in the Central Valley of California: How to select a site that can be used to recharge the groundwater? Where is there sand and gravel? clay? Where will the water go? We will review data from the area and develop a plan for the acquisition of geophysical data to image sediment texture in the subsurface. Data will be acquired during a weekend field trip to the community. Each week includes two hours of lectures; plus one 1.5-hour lab that involves acquisition of field data, or computer modeling/analysis of data. Pre-requisite: CME 100 or Math 51, or co-registration in either. (Cardinal Course certified by the Haas Center)
GEOPHYS 201	Frontiers of Geophysical Research at Stanford: Faculty Lectures	X		Required for new students entering the department. Second-year and other graduate students may attend either for credit or as auditors. Department faculty and senior research staff introduce the frontiers of research problems and methods being employed or developed in the department and unique to department faculty and students: what the current research is, why the research is important, what methodologies and technologies are being used, and what the potential impact of the results might be.
GEOPHYS 202	Reservoir Geomechanics	X		Basic principles of rock mechanics and the state of stress and pore pressure in sedimentary basins related to exploitation of hydrocarbon and geothermal reservoirs. Mechanisms of hydrocarbon migration, exploitation of fractured reservoirs, reservoir compaction and subsidence, hydraulic fracturing, utilization of directional and horizontal drilling to optimize well stability. Given alternate years.
GEOPHYS 203	Fluids and Flow in the Earth: Computational Methods (Same as GEOPHYS 181)	X		Interdisciplinary problems involving the state and movement of fluids in crustal systems, and computational methods to model these processes. Examples of processes include: nonlinear, time-dependent flow in porous rocks; coupling in porous rocks between fluid flow, stress, deformation, and heat and chemical transport; percolation of partial melt; diagenetic processes; pressure solution and the formation of stylolites; and transient pore pressure in fault zones. MATLAB, Lattice-Boltzmann, and COMSOL Multiphysics
GEOPHYS 208	Unconventional Reservoir Geomechanics	X		This course will investigate oil and gas production from extremely low permeability reservoirs. Lectures and exercises will address 1) the physical and fluid transport properties of unconventional reservoir formations, 2) stimulation techniques such as hydraulic fracturing and 3) understanding microseismicity associated with hydraulic stimulation and induced seismicity associated with wastewater injection. Prerequisite: GEOPHYS 202 or concurrent enrollment in GEOPHYS 202.

GEOPHYS 210	Basic Earth Imaging (Same as GEOPHYS 188)	X		Echo seismogram recording geometry, head waves, moveout, velocity estimation, making images of complex shaped reflectors, migration by Fourier and integral methods. Anti-aliasing. Dip moveout. Computer labs. See <a href="http://sep.stanford.edu/sep/prof/">http://sep.stanford.edu/sep/prof/</a> . Offered every year, autumn quarter. n*The Geophys180 cross-listing is considered an advanced undergraduate course.
GEOPHYS 211	Environmental Soundings Image Estimation	X		Imaging principles exemplified by means of imaging geophysical data of various uncomplicated types (bathymetry, altimetry, velocity, reflectivity). Adjoints, back projection, conjugate-gradient inversion, preconditioning, multidimensional autoregression and spectral factorization, the helical coordinate, and object-based programming. Common recurring issues such as limited aperture, missing data, signal/noise segregation, and nonstationary spectra. See <a href="http://sep.stanford.edu/sep/prof/">http://sep.stanford.edu/sep/prof/</a> .
GEOPHYS 214	Water Management in Agricultural Areas	X		The course will introduce the new generation of methods used for investigating groundwater systems. The primary focus would be on methods for estimating the components of the aquifer water balance, which are critical elements needed for reliable projections of future conditions. The structure of the course will be lectures followed by student presentations based on follow-up readings and working with the extensive dataset from the High Plains aquifer in Kansas. The course will draw heavily on the short courses and workshops Dr. Butler has presented to practicing professionals and students over the last 15 years.
GEOPHYS 220	Ice, Water, Fire (Same as GEOPHYS 120)	X		Introductory application of continuum mechanics to ice sheets and glaciers, water waves and tsunamis, and volcanoes. Emphasis on physical processes and mathematical description using balance of mass and momentum, combined with constitutive equations for fluids and solids. Designed for undergraduates with no prior geophysics background; also appropriate for beginning graduate students. Prerequisites: CME 100 or MATH 52 and PHYSICS 41 (or equivalent). Offered every year.
GEOPHYS 250	Geodynamics: Our Dynamic Earth (Same as GEOPHYS 150)	X		What processes determine the large-scale structure and motion of Earth? How does convection deep within Earth drive plate tectonics and the formation of ocean basins and mountain ranges? Drawing from fundamental principles of mechanics and thermodynamics, we develop mathematical theories for heat flow, mantle convection, and the bending and breaking of Earth's brittle crust. Scaling arguments and dimensional analysis provide intuition that is refined through analytical and numerical solution (in MATLAB) of the governing equations and validated through comparison with observations.
GEOPHYS 257	Introduction to Computational Earth Sciences	X		Techniques for mapping numerically intensive algorithms to modern high performance computers such as the Center for Computational Earth and Environmental Science's (CEES). Topics include computer architecture performance analysis, and parallel programming. Topics covered include pthreads OpenMP; MPI, Cilk++, and CUDA.. Exercises using SMP and cluster computers.
GEOPHYS 259	Laboratory Methods in Geophysics (Same as GEOPHYS 162)	X		Lab. Types of equipment used in experimental rock physics. Principles and measurements of geophysical properties such as porosity, permeability, acoustic wave velocity, and resistivity through lectures and laboratory experiments. Training in analytical project writing skills and understanding errors for assessing accuracy and variability of measured data. Students may investigate a scientific problem to support their own research. Prerequisites: Physics 45 (Light and Heat); and CME 100 (Vector Calculus).
GEOPHYS 260	Rock Physics for Reservoir Characterization (Same as GEOPHYS 185)	X		How to integrate well log and laboratory data to determine and theoretically generalize rock physics transforms between sediment wave properties (acoustic and elastic impedance), bulk properties (porosity, lithology, texture, permeability), and pore fluid conditions (pore fluid and pore pressure). These transforms are used in seismic interpretation for reservoir properties, and seismic forward modeling in what-if scenarios.
GEOPHYS 284	Hydrogeophysics	X		The use of geophysical methods for imaging and characterizing the top 500 meters of Earth for hydrogeologic applications. Includes material properties, forward modeling, data acquisition, inversion, and integration with other forms of measurement. Each week includes two hours of lectures; plus one 1.5-hour lab that involves acquisition of field data, or computer modeling/analysis of data. Offered occasionally.
GEOPHYS 290	Tectonophysics (Same as GEOPHYS 186)	X		The physics of faulting and plate tectonics. Topics: plate driving forces, lithospheric rheology, crustal faulting, and the state of stress in the lithosphere. Exercises: lithospheric temperature and strength profiles, calculation of seismic strain from summation of earthquake moment tensors, slip on faults in 3D, and stress triggering and inversion of stress from earthquake focal mechanisms.
GEOPHYS 308	Topics in Disaster Resilience Research (Same as CEE 308)	X		This seminar will explore past and current research on disaster risk and resilience, towards the development of new frontiers in resilience engineering science research. Designed for graduate students engaged in the topic of risk and resilience research, the seminar will be organized around weekly readings and discussion groups. May be repeat for credit.
GEOPHYS 385A	Reflection Seismology	X		Research in reflection seismology and petroleum prospecting. May be repeated for credit.
GEOPHYS 385B	Environmental Geophysics	X		Research on the use of geophysical methods for near-surface environmental problems. May be repeated for credit.
GEOPHYS 385D	Theoretical Geophysics	X		Research on physics and mechanics of earthquakes, volcanoes, ice sheets, and glaciers. Emphasis is on developing theoretical understanding of processes governing natural phenomena.
GEOPHYS 385E	Tectonics	X		Research on the origin, major structures, and tectonic processes of the Earth's crust. Emphasis is on use of deep seismic reflection and refraction data.
GEOPHYS 385G	Radio Glaciology	X		Research on the acquisition, processing, and analysis of radio geophysical signals in observing the subsurface conditions and physical processes of ice sheets, glaciers, and icy moons.
GEOPHYS 385K	Crustal Mechanics	X		Research in areas of petrophysics, seismology, in situ stress, and subjects related to characterization of the physical properties of rock in situ. May be repeated for credit.

GEOPHYS 385L	Earthquake Seismology, Deformation, and Stress	X		Research on seismic source processes, crustal stress, and deformation associated with faulting and volcanism. May be repeated for credit.
GEOPHYS 385R	Physical Volcanology	X		Research on volcanic processes and their environmental factors and effects.
GEOPHYS 385Z	Radio Remote Sensing	X		Research applications, especially crustal deformation measurements. Recent instrumentation and system advancements.
GERMAN 136	Refugees, Politics and Culture in Contemporary Germany (Same as GERMAN 336)	X		Responses to refugees and immigration to Germany against the backdrop of German history and in the context of domestic and European politics. Topics include: cultural difference and integration processes, gender roles, religious traditions, populism and neo-nationalism. Reading knowledge of German, another European language, or an immigrant language will be useful for research projects, but not required.
GS 1	Introduction to Geology (Same as EARTHSYS 11)	X		Lectures, hands-on laboratories, in-class activities, and one field trip. Focus is on the physical and chemical processes of heat and mass transfer within the earth and its fluid envelopes, including deep-earth, crustal, surface, and atmospheric processes. Topics include plate tectonics, the cycling and formation of different types of rocks, and how geologists use rocks to understand Earth's history.
GS 4	Coevolution of Earth and Life (Same as EARTHSYS 4)		X	Introduction to the history of the Earth, with a focus on processes that maintain or threaten habitability. Principles of stratigraphy, correlation, the geological timescale, the history of biodiversity, and the interpretation of fossils. The use of data from sedimentary geology, geochemistry, and paleontology to test theories for critical events in Earth history such as mass extinctions. One half-day field trip.
GS 5	Living on the Edge (Same as EARTH 15)	X		A weekend field trip along the Pacific Coast. Tour local beaches, geology, and landforms with expert guides from the School of Earth, Energy & Environmental Sciences. Enjoy a BBQ dinner and stay overnight in tents along the Santa Cruz coast. Get to know faculty and graduate students in Stanford Earth. Requirements: Two campus meeting and weekend field trip (Fall Quarter: Nov 5-6; Spring Quarter: April 8-9) to Pacific Coast. Enrollment limited to 25. Freshman have first choice. If you are interested in signing up for the course, complete this form: <a href="http://web.stanford.edu/~aferree/GS5.fb">http://web.stanford.edu/~aferree/GS5.fb</a>
GS 14	Our National Parks (Same as EARTH 14, EARTH 114A, GS 114A)		X	Explore the history and natural science of three national parks proximal to Stanford. Under the guidance of instructors, students will work in teams to learn about chosen aspects of these parks, develop dynamic self-guided tours for public consumption, and implement (and publish) these tours using the XibitEd app for iPhones. Students will learn how to present their findings to a general, non-scientific audience, delineate physical locations at which storytelling will take place through the XibitEd system, and create and configure the content for the system. The course will culminate in the publishing of the experiential learning tours, as well as a weekend-long field trip to the Pinnacles National Park
GS 43Q	Environmental Problems		X	Preference to sophomores. Components of multidisciplinary environmental problems and ethical questions associated with decision making in the regulatory arena. Students lead discussions on environmental issues such as groundwater contamination from point and nonpoint sources, cumulative watershed effects related to timber and mining practices, acid rain, and subsurface disposal of nuclear waste.
GS 55Q	The California Gold Rush: Geologic Background and Environmental Impact	X		Preference to sophomores. Topics include: geologic processes that led to the concentration of gold in the river gravels and rocks of the Mother Lode region of California; and environmental impact of the Gold Rush due to population increase, mining operations, and high concentrations of arsenic and mercury in sediments from hard rock mining and milling operations. Recommended: introductory geology.
GS 90	Introduction to Geochemistry	X		The chemistry of the solid earth and its atmosphere and oceans, emphasizing the processes that control the distribution of the elements in the earth over geological time and at present, and on the conceptual and analytical tools needed to explore these questions. The basics of geochemical thermodynamics and isotope geochemistry. The formation of the elements, crust, atmosphere and oceans, global geochemical cycles, and the interaction of geochemistry, biological evolution, and climate. Recommended: introductory chemistry.
GS 102	Earth Materials: Introduction to Mineralogy	X		The minerals and materials that comprise the earth and their uses in modern society. How to identify, classify, and interpret rock-forming minerals. Emphasis is on information provided by common minerals about the nature of the Earth's interior and processes such as magmatism and metamorphism that operate there, as well as the major processes of weathering and erosion that link plate tectonics to earth cycles. Required lab section. Prerequisite: introductory geology course. Recommended: introductory chemistry.
GS 103	Earth Materials: Rocks in Thin Section	X		Use of petrographic microscope to identify minerals and common mineral associations in igneous, metamorphic, and sedimentary rocks. Crystallization histories, mineral growth and reaction relations, deformation textures in metamorphic rocks, and provenance of siliciclastic rocks. Required lab section. Prerequisite 102.
GS 104	Introduction to Petrology (Same as GS 204)	X		The origin of igneous and metamorphic rocks as a function of geologic and plate tectonic setting. How to determine the temperature and pressure conditions of formation from mineral assemblages, textures, and compositions. Undergraduate students majoring in Geological Sciences must take the course for 4 units and complete a weekly lab section examining rocks in thin section. Prerequisite: introductory geology course, GS102; those taking the lab must also have completed GS103 or have equivalent experience with a petrographic microscope.
GS 106	Sedimentary Geology and Depositional Systems	X		Topics: weathering, erosion and transportation, deposition, origins of sedimentary structures and textures, sediment composition, diagenesis, sedimentary facies, tectonics and sedimentation, and the characteristics of the major siliciclastic and carbonate depositional environments. Required Lab Section: methods of analysis of sediments in hand specimen and thin section. There is a required field problem trips to the field site(s) during the quarter, data collection and analysis, and preparation of a final written and oral report.

GS 110	Structural Geology and Tectonics	X		Theory, principles, and practical techniques to measure, describe, analyze, and interpret deformation-related structures on Earth. Collection of fault and fold data in the field followed by lab and computer analysis; interpretation of geologic maps and methods of cross-section construction; structural analysis of fault zone and metamorphic rocks; measuring deformation; regional structural styles and associated landforms related to plate tectonic convergence, rifting, and strike-slip faulting; the evolution of mountain belts and formation of sedimentary basins. Prerequisite: GS 1, calculus.
GS 130	Soil Physics and Hydrology	X		The occurrence, distribution, circulation, and reaction of water at the surface and within the near surface. Topics: precipitation, evapotranspiration, infiltration and vadose zone, groundwater, surface water and streamflow generation, and water balance estimates. Current and classic theory in soil physics and hydrology. Urban, rangeland, and forested environments. Recommended: 102
GS 131	Hydrologically-Driven Landscape Evolution	X		Materials of the Earth and hydrologically driven landscape processes. Topics: hillslope hydrology, weathering of rocks and soils, erosion, flow failures, mass wasting, and conceptual models of landscape evolution. Current and classic theory in geomorphology.
GS 150	Senior Seminar: Issues in Earth Sciences (Same as GEOPHYS 199)		X	Focus is on written and oral communication in a topical context. Topics from current frontiers in earth science research and issues of concern to the public. Readings, oral presentations, written work, and peer review.
GS 163	Introduction to Isotope Geochemistry (Same as GS 263)	X		Isotopic variations in nature provide key insights into the age of the Earth and its rocks, as well as the evolution of Earth's major reservoirs, including the mantle, crust and hydrosphere. How do we know the age of the Earth? When did continents first form? How have the oceans changed through time? This course will address these and related topics by focusing on the fundamental processes that govern isotopic variations, including radioactive decay, mass dependent isotope fractionation and dynamic transfers between reservoirs.
GS 170	Environmental Geochemistry (Same as GS 270, EARTHSYS 170)	X		Solid, aqueous, and gaseous phases comprising the environment, their natural compositional variations, and chemical interactions. Contrast between natural sources of hazardous elements and compounds and types and sources of anthropogenic contaminants and pollutants. Chemical and physical processes of weathering and soil formation. Chemical factors that affect the stability of solids and aqueous species under earth surface conditions. The release, mobility, and fate of contaminants in natural waters and the roles that water and dissolved substances play in the physical behavior of rocks and soils. The impact of contaminants and design of remediation strategies. Case studies. Prerequisite: 90 or consent of instructor
GS 171	Geochemical Thermodynamics	X		Introduction to the application of chemical principles and concepts to geologic systems. The chemical behavior of fluids, minerals, and gases using simple equilibrium approaches to modeling the geochemical consequences of diagenetic, hydrothermal, metamorphic, and igneous processes. Topics: reversible thermodynamics, solution chemistry, mineral-solution equilibria, reaction kinetics, and the distribution and transport of elements by geologic processes. Prerequisite: GS 102
GS 180	Igneous Processes (Same as GS 280)	X		For juniors, seniors and beginning graduate students in Earth Sciences. Structure and physical properties of magmas; use of phase equilibria and mineral barometers and thermometers to determine conditions of magmatic processes; melting and magmatic lineages as a function of tectonic setting; processes that control magma composition including fractional crystallization, partial melting, and assimilation; petrogenetic use of trace elements and isotopes. Labs emphasize identification of volcanic and plutonic rocks in thin section and interpretation of rock textures. Prerequisite 102, 103, or consent of instructor
GS 182	Field Trip to Cascade Volcanoes of California	X		Three-day field trip (involving light hiking and camping) to study active and dormant volcanoes of northern California, including Mt. Shasta, Mt. Lassen, and Medicine Lake, and their relationship to regional extensional faulting. Features visited include stratovolcanoes, cinder cones, lava caves, obsidian flows, hot springs and hydrothermal alteration, volcanic blast deposits and mudflows, debris avalanches, fault scarps. Recommended: 1 or equivalent. Limited enrollment; preference to frosh, sophs, and undergraduates and graduates majoring in SE3.
GS 190	Research in the Field (Same as GS 295)		X	Two to three-week long courses that provide students with the opportunity to collect data in the field as part of a team-based investigation of research questions or topics under the expert guidance of knowledgeable faculty and graduate students. Topics and locations vary. May be taken multiple times for credit. Prerequisites: GS 1, GS 102, GS 105.
GS 206	Topics in Organismal Paleobiology	X		Seminar course covering an area of structural biology, physiology, and ecology relevant to understanding the fossil record. Topic will change each time the course is offered. Examples of potential topics are biomineralization, fluid mechanics, biomechanics, taphonomy & biochemical preservation, and photosynthesis in air and water.
GS 208	Topics in Geobiology (Same as ESS 208)	X		Reading and discussion of classic and recent papers in the field of Geobiology. Co-evolution of Earth and life; critical intervals of environmental and biological change; geomicrobiology; paleobiology; global biogeochemical cycles; scaling of geobiological processes in space and time.
GS 216	Topics in Basin & Petroleum System Modeling	X		Reading and discussion of research in the field of Basin & Petroleum System Modeling.
GS 221	What Makes a Habitable Planet? (Same as GS 121)		X	Physical processes affecting habitability such as large impacts and the atmospheric greenhouse effect, comets, geochemistry, the rise of oxygen, climate controls, and impact cratering. Detecting and interpreting the spectra of extrasolar terrestrial planets. Student-led discussions of readings from the scientific literature. Team taught by planetary scientists from NASA Ames Research Center.

GS 228	Evolution of Terrestrial Ecosystems (Same as GS 128, EARTHSYS 128)		X	The what, when, and how do we know it regarding life on land including plants, fungi, invertebrates, and vertebrates (yes, dinosaurs) and how all of those components interact with each other and with changing climates, continental drift, atmospheric composition, and environmental perturbations like glaciation and mass extinction.
GS 237	Surface and Near-Surface Hydrologic Response (Same as CEE 260B)	X		Quantitative review of process-based hydrology and geomorphology. Introduction to finite-difference and finite-element methods of numerical analysis. Topics: biometeorology, unsaturated and saturated subsurface fluid flow, overland and open channel flow, and physically-based simulation of coupled surface and near-surface hydrologic response. <u>Links hydrogeology, soil physics, and surface water hydrology.</u>
GS 240	Geostatistics (Same as ENERGY 240)	X		Geostatistical theory and practical methodologies for quantifying and simulating spatial and spatio-temporal patterns for the Earth Sciences. Real case development of models of spatial continuity, including variograms, Boolean models and training images. Estimation versus simulation of spatial patterns. Loss functions. Estimation by kriging, co-kriging with secondary data. Dealing with data on various scales. Unconditional and conditional Boolean simulation, sequential simulation for continuous and categorical variables. Multi-variate geostatistical simulation. Probabilistic and pattern-based approaches to multiple-point simulation. Trend, secondary variable, auxiliary variable and probability-type constraints. Quality control techniques on generated models. Workflows for practical geostatistical applications in mining, petroleum, hydrogeology, remote sensing and environmental sciences. prerequisites: Energy 160/260 or basic course in data analysis/statistics
GS 246	Reservoir Characterization and Flow Modeling with Outcrop Data (Same as ENERGY 246, ENERGY 146)	X		Project addressing a reservoir management problem by studying an outcrop analog, constructing geostatistical reservoir models, and performing flow simulation. How to use outcrop observations in quantitative geological modeling and flow simulation. <u>Relationships between disciplines. Weekend field trip.</u>
GS 248	The Petroleum System: Investigative method to explore for conventional & unconventional hydrocarbons	X		How the petroleum system concept can be used to more systematically investigate how hydrocarbon fluid becomes an unconventional accumulation in a pod of active source rock and how this fluid moves from this pod to a conventional pool. How to identify, map, and name a petroleum system. The conventional and unconventional accumulation as well as the use of modeling.
GS 250	Sedimentation Mechanics	X		The mechanics of sediment transport and deposition and the origins of sedimentary structures and textures as applied to interpreting modern sediments and ancient rock sequences. Dimensional analysis, fluid flow, drag, boundary layers, open channel flow, particle settling, erosion, sediment transport, sediment gravity flows, soft sediment deformation, and fluid escape. <u>Required field trip and lab section.</u>
GS 253	Petroleum Geology and Exploration	X		The origin and occurrence of hydrocarbons. Topics: thermal maturation history in hydrocarbon generation, significance of sedimentary, structural and tectonic setting, trapping geometries and principles of accumulation, and exploration techniques.
GS 255	Basin and Petroleum System Modeling	X		For advanced undergraduates or graduate students. Students use stratigraphy, subsurface maps, and basic well log, lithologic, paleontologic, and geochemical data to construct 1-D, 2-D, and 3-D models of petroleum systems that predict the extent of source-rock thermal maturity, petroleum migration paths, and the volumes and compositions of accumulations through time (4-D). Recent software such as PetroMod designed to reconstruct basin geohistory.
GS 259	Stratigraphic Architecture	X		The stratigraphic architecture of deposits associated with a spectrum of depositional environments, using outcrop and subsurface data. Participants read and discuss selected literature.
GS 266	Managing Nuclear Waste: Technical, Political and Organizational Challenges (Same as IPS 266)	X		The essential technical and scientific elements of the nuclear fuel cycle, focusing on the sources, types, and characteristics of the nuclear waste generated, as well as various strategies for the disposition of spent nuclear fuel - including reprocessing, transmutation, and direct geologic disposal. Policy and organizational issues, such as: options for the characteristics and structure of a new federal nuclear waste management organization, options for a consent-based process for locating nuclear facilities, and the regulatory framework for a geologic repository.
GS 290	Departmental Seminar in Geological Sciences	X		Current research topics. Presentations by guest speakers from Stanford and elsewhere. May be repeated for credit.
GS 293A	Modern Carbonates Field Trip	X		Reading and discussion of papers addressing current topics in carbonate sedimentology, with a focus on modern carbonate sediments of the Bahamas.
GS 336	Stanford Alpine Project Seminar	X		Weekly student presentations on continental collision tectonics, sedimentology, petrology, geomorphology, climate, culture, and other topics of interest. Students create a guidebook of geologic stops in advance of field trip. May be repeated for credit.

GSBGEN 305	Investing for Good	X		<p>Investing for Good will introduce students to the entire spectrum of purposeful, values-driven, and impact investing. We examine the field from the perspective of an institutional investor (i.e. fund manager, investment advisor, endowment manager, head of a family office, etc). Our goal is to have students emerge with a practical and analytical framework for: 1. evaluating impact and mission-aligned investments across multiple asset classes and sectors; 2. constructing a portfolio using impact as a lens; 3. designing an impact investment company; and 4. understanding the many practical and theoretical challenges confronting this exciting emerging field.</p> <p>We start by exploring some fundamental questions: what is a purposeful or impact investment; can impact investments be defined along a spectrum from conventional investing and philanthropy; whose money is it; what are the constraints and opportunities; how do we (re)define return and/or performance. We briefly analyze impact investing in the context of modern portfolio theory. We then develop a framework for portfolio construction and evaluation across four criteria: risk, return, liquidity, and impact. Through a combination of class dialogues, role plays, and case discussions, we will explore a wide variety of asset classes, impact themes, and investment challenges. A series of team-based investment committee simulations will comprise a significant portion of the course and will provide a significant experiential learning experience.</p>
GSBGEN 314	Creating High Potential Ventures in Developing Economies	X		<p>This course addresses the distinctive challenges and opportunities of launching high-potential new ventures in developing economies. Developing economies are attractive targets for entrepreneurs because many are just starting to move up the growth curve, and they offer low-cost operating environments that can be great development labs for potentially disruptive innovations. They increase in attractiveness when their political institutions stabilize and they become more market-friendly. At the same time, developing economies pose serious challenges. Pioneering entrepreneurs take on significant risks to gain early mover advantages. Specifically, entrepreneurs will not be able to count on the same kind of supportive operating environments that we take for granted in the developed world. They often face cumbersome permit and licensing processes, poorly developed financial and labor markets, problematic import and export procedures, unreliable local supply chains, weak infrastructure, corruption, currency risks, limited investment capital, lack of financial exits and more. This course is designed to help would-be entrepreneurs - both founders and members of entrepreneurial teams - better understand and prepare for these issues as they pursue the opportunities and address the challenges to start, grow, and harvest their ventures in these environments.</p> <p>GSB314 combines a seminar/discussion format (Tuesdays) with a team-based project (Thursdays). For the Tuesday sessions, students will read about and discuss the key challenges described above and potential solutions. Guests will describe their own startup and investing experiences in developing economies and answer questions. A framework based on the recently published World Economic Forum (WEF) report on "Entrepreneurial Ecosystems Around the Globe and Company Growth Dynamics" will be used to structure the course. Each student will prepare a short paper on a topic of interest from this portion of the course.</p> <p>The Thursday sessions is a team-based exercise for students who either have a specific idea or want to join a team of classmates to pursue more deeply an understanding of the team's country of focus and an initial investigation of the idea's viability. Students must come in willing to be team players and do the work necessary to complete this exercise over the full quarter. Each team member's contributions will be assessed by fellow teammates. Teams will be formed before the start of class or on the first day at the latest. The team will describe, in a final presentation, the challenges and opportunities in their country using the WEF framework. The final presentation will also include the team's thoughts on the viability of their proposed venture and how it capitalizes on their country's assets and addresses its challenges. A detailed business plan is not required; however, specific recommendations and plans for next steps that would be carried out during a 3 to 6 month field and market research study in the country will be part of the final presentation.</p> <p>Note: Students who only want to participate in the seminar/discussion portion of the class and not do a team-based project (see details below) may enroll in GSB514 for 2 units.</p>
GSBGEN 319	Biochemical Engineering	X		<p>Systems-level combination of chemical engineering concepts with biological principles. The production of protein pharmaceuticals as a paradigm to explore quantitative biochemistry and cellular physiology, the elemental stoichiometry of metabolism, recombinant DNA technology, synthetic biology and metabolic engineering, fermentation development and control, product isolation and purification, protein folding and formulation, and biobusiness and regulatory issues. Prerequisite: CHEMENG 181 (formerly 188) or BIOSCI 41 or equivalent.</p>

GSBGEN 336	Energy Markets and Policy		X	<p>Transforming the global energy system to reduce climate change impacts, ensure security of supply, and foster economic development of the world's poorest regions depends on the ability of commercial players to deliver the needed energy at an affordable price at scale. Technological innovation is a necessary but not sufficient condition for this to occur. The complex institutional frameworks that regulate energy markets in the United States and around the world will play a major role in determining the financial viability of firms in the energy sector. In this course we survey the economic, regulatory and technological constraints facing energy enterprises of all types and consider what kinds of business models work in each setting. We study in detail how markets function for carbon (assessing the advantages and disadvantages of different policy tools and considering in particular California's implementation of A.B. 32); electricity markets (with a focus on understanding how both retail and wholesale electricity prices are determined and how market participants hedge short-term price risk); renewable energy technologies (focusing on ways to manage intermittency and on how renewable energy businesses respond to government incentives); nuclear power (as a case study of how the regulatory process affects investment decisions); oil and natural gas (treating both conventional and unconventional resources and emphasizing the key role of risk management in an industry characterized by uncertainty and high capital requirements); transportation fuels (discussing biofuels incentives, fuel efficiency standards, and other policy tools to lower carbon intensity in the transportation sector); and energy for low-income populations, for which affordability and distribution pose special challenges. The objective of the course is to provide a robust intellectual framework for analyzing how a business can most constructively participate in any sector like energy that is heavily affected by government policy.</p>
GSBGEN 367	Problem Solving for Social Change (Same as EDUC 377G)	X		<p>GSB graduates will play important roles in solving many of today's and tomorrow's major societal problems - such as improving educational and health outcomes, conserving energy, and reducing global poverty - which call for actions by nonprofit, business, and hybrid organizations as well as governments. This course teaches skills and bodies of knowledge relevant to these roles through problems and case studies drawn from nonprofit organizations, for-profit social enterprises, and governments, as well as novel financing mechanisms like impact investments and social impact bonds. Topics include designing, implementing, scaling, and evaluating social strategies; systems thinking; decision making under risk; psychological biases that adversely affect people's decisions; methods for influencing individuals' and organization's behavior, ranging from incentives and penalties to "nudges;" and human-centered design. Students who have encountered some of these topics in other courses are likely to gain new perspectives and encounter new challenges in applying them to solving social problems.</p>
GSBGEN 381	Philanthropy: Strategy, Innovation and Social Change (Same as EDUC 377C)	X		<p>Appropriate for any student driven to effect positive social change from either the for-profit or nonprofit sector, Strategic Philanthropy (GSBGEN 381/ EDUC 377C) will challenge students to expand their own strategic thinking about philanthropic aspiration and action. In recent decades, philanthropy has become an industry in itself - amounting to nearly \$300 billion in the year 2011. Additionally, the last decade has seen unprecedented innovation in both philanthropy and social change. This course explores the key operational and strategic distinctions between traditional philanthropic entities, such as community foundations, private foundations, and corporate foundations; and innovative models, including funding intermediaries, open-source platforms, technology-driven philanthropies, and venture philanthropy partnerships. Course work will include readings and case discussions that encourage students to analyze both domestic and global philanthropic strategies as they relate to foundation mission, grant making, evaluation, financial management, infrastructure, knowledge management, policy change, and board governance. Guest speakers will consist of high profile philanthropists, foundation presidents, social entrepreneurs and Silicon Valley business leaders creating new philanthropic models. The course will culminate in an individual project in which students will complete a business plan for a \$10 million private foundation.</p>

GSBGEN 511	Making Social Ventures Happen by Attracting Financial and Human Capital	X		<p>Social ventures require leadership, funding, expertise, skills and networks to get off the ground, grow and scale. This course will focus on the key strategies for building and leveraging a network of champions to capitalize a social venture at early-stage, and for sustaining and growing that network as the venture grows. This class is applicable to intrapreneurs, changemakers within major institutions, (private or public), board members, impact investors, those who aspire to be senior leaders within social ventures and social entrepreneurs (founders). Co-led by a practicing venture philanthropist and a social entrepreneur, this interactive, pragmatic course will:</p> <ul style="list-style-type: none"> <li>- Discuss the critical financial and human capital needs of organizations and companies at different life stages.</li> <li>- Explore the concept of champions and the different types of champions including board chairs, co-founders, mentors, faculty advisors, donors, investors, community evangelists, and fellow entrepreneurs.</li> <li>- Learn about effective networks and how to build them, including the role of communications, relationship-building, and crisis management.</li> <li>- Explore the concept of a powerful vulnerability and the art of "influence without authority" in attracting financial and human capital to the mission and making social ventures happen. Special emphasis will be given to developing co-founders and founding teams, boards and funders/investors as champions.</li> <li>- Develop a roadmap for the ways you will support social ventures throughout your career.</li> <li>- Meet social entrepreneurs and their champions who promote them within various power structures (major corporations, government, the institutional funding community) to learn about the successes and failures of their partnerships. Guest speakers will be posted prior to start of class.</li> <li>- Invite you to join instructors, guest speakers and fellow students for casual dinner on both Wednesdays after class.</li> <li>- Get to know your fellow classmates who share a passion for addressing the world's intractable problems and for creating systemic change.</li> </ul>
GSBGEN 514	Creating High Potential Ventures in Developing Economies	X		<p>This course addresses the distinctive challenges and opportunities of launching high-potential new ventures in developing economies. Developing economies are attractive targets for entrepreneurs because many are just starting to move up the growth curve, and they offer low-cost operating environments that can be great development labs for potentially disruptive innovations. They increase in attractiveness when their political institutions stabilize and they become more market-friendly. At the same time, developing economies pose serious challenges. Pioneering entrepreneurs take on significant risks to gain early mover advantages. Specifically, entrepreneurs will not be able to count on the same kind of supportive operating environments that we take for granted in the developed world. They often face cumbersome permit and licensing processes, poorly developed financial and labor markets, problematic import and export procedures, unreliable local supply chains, weak infrastructure, corruption, currency risks, limited investment capital, lack of financial exits and more. This course is designed to help would-be entrepreneurs - both founders and members of entrepreneurial teams - better understand and prepare for these issues as they pursue the opportunities and address the challenges to start, grow, and harvest their ventures in these environments.</p>
GSBGEN 532	Clean Energy Opportunities: Business Models and Innovations	X		<p>This course examines business models and opportunities related to clean energy, specifically to low-carbon energy. We examine emerging trends for this sector in the context of technological change, business opportunities and the parameters set by public policy. Specific topics to be examined include: Carbon Emissions and the Clean Energy Transition- Funding Innovative Energy Companies- Modeling Cost Competitiveness of Alternative Energy Technologies- The Momentum of Renewable Energy: Solar PV and Wind- The Changing Business Model of Utilities- Storage and Sustainable Transportation</p>
GSBGEN 569	The Open Road: Innovation in Cars, Driving, and Mobility	X		<p>This new course will look at ongoing and upcoming innovation in cars, driving, and mobility from three perspectives: (1) technology, (2) economics &amp; business Models, and (3) policy. We'll survey changes in powering vehicles (e.g. electrification and biofuels), in vehicle connectivity and communications, and most especially changes in autonomy and self-driving vehicles. We'll look at changes in the economics of cars, vehicles, and driving—new business models, shared ownership, mobility as a service, as well as who some of the major players are in this nascent field and what they're doing/developing. And we'll explore the interactions of technology and economics with policy and broader societal changes—direct effects like safety, legal liability, and who can drive; indirect effects on traffic, insurance, infrastructure needs, fuel taxes, and the environment; as well as longer-term and even bigger changes in daily life and where and how we live, work, and drive.</p>
HISTORY 3	The Historical and Geographical Background of Current Global Events (Same as HISTORY 13)	X		<p>This one-unit lecture course aims to provide the historical and geographical context necessary for understanding the most important global issues of the day. Weekly lectures will explore two or more major issues in some detail, illustrating them with maps, timelines, photographs, and other images. Topics are not planned in advance, but will <u>instead reflect stories currently in the news.</u></p>
HISTORY 5A	History of Information: From Moveable Type to Machine Learning (Same as HISTORY 105A)	X		<p>Students who have taken HISTORY 205A/305A should not enroll in this course. Information has a history-- and it's not the one we've been told by Silicon Valley. In a series of propulsive, empirically rich, and provocative lectures and discussions, this course deep-dives into the history of information and IT, including moveable type, telegraphy, typewriting, personal computing, gaming, social media, algorithms, machine learning, Digital Humanities, and more. You will leave the course with entirely new perspectives on information, including how IT shapes-- and is shaped by-- culture, nationality, gender, ethnicity, economy, and environment.</p>
HISTORY 8W	Human Trafficking Service Learning	X		<p>Continuation of service learning. Only for students who completed HISTORY 6W/7W. (Cardinal Course certified by the Haas Center)</p>

HISTORY 44	Women and Gender in Science, Medicine and Engineering (Same as HISTORY 144, FEMGEN 144)	X		Men's and women's roles in science, medicine, and engineering over the past 200 years with a focus on the present. What efforts are underway globally to transform research institutions so that both men's and women's careers can flourish? How have science and medicine studied and defined males and females? How can we harness the creative power of gender analysis to enhance knowledge and spark innovation?
HISTORY 44Q	Gendered Innovations in Science, Medicine, Engineering, and Environment (Same as FEMGEN 44Q)	X		Section 1 focuses on the history of women in science, medicine, and engineering. Section 2 looks at transforming research institutions so that both men and women can flourish. Section 3 explores how sex and gender analysis can enhance creativity. We discuss concrete examples of how taking gender into account has yielded new research results. Stanford University currently has a multiple year collaboration with the European Commission for Gendered Innovations, and this class will be part of that project. This course fulfills the second level Writing and Rhetoric Requirement (WRITE 2) and will emphasize oral and multimedia presentation.
HISTORY 48Q	South Africa: Contested Transitions (Same as AFRICAAM 48Q)	X		Preference to sophomores. The inauguration of Nelson Mandela as president in May 1994 marked the end of an era and a way of life for South Africa. The changes have been dramatic, yet the legacies of racism and inequality persist. Focus: overlapping and sharply contested transitions. Who advocates and opposes change? Why? What are their historical and social roots and strategies? How do people reconstruct their society? Historical and current sources, including films, novels, and the Internet.
HISTORY 70	Culture, Politics, and Society in Latin America (Same as HISTORY 170B)	X		This course examines Latin American history from the colonial era to the present day. Key issues include colonialism, nationalism, democracy, and revolution. Sources include writings in the social sciences as well as primary documents, fiction, and film.
HISTORY 76F	CITY, URBANISATION PROCESSES AND URBAN POLICIES IN LATIN AMERICA AND THE CARIBBEAN (Same as HISTORY 176F, HISTORY 376F)	X		Note: Course is taught in Spanish. This course is structured around two key concepts: dependence and irregularity in urban development. This course reviews the urbanisation process and urban policies of Latin America and the Caribbean, exploring their consequences and challenges at the intra-urban level in relation to economic, social and cultural processes. Special attention will be paid to the case of Cuba, a socialist country with its own internal dynamics which is currently undergoing a period of transition.
HISTORY 97S	Toxic Water and the "Aircocalypse": Industrial Pollution and Society in Modern East Asia		X	As East Asia's economic power and influence has grown over the past century, environmental issues linked to its industrialization attract worldwide alarm. Growing concerns about global climate change make the understanding and resolution of East Asia's pollution problem not just a regional issue, but an imperative for global survival. In this course, we will explore societal debates about the problem of industrial pollution in China, Japan, and Korea from a historical perspective. Priority given to history majors and minors.
HISTORY 102	History of the International System (Same as INTNLREL 102)	X		After defining the characteristics of the international system at the beginning of the twentieth century, this course reviews the primary developments in its functioning in the century that followed. Topics include the major wars and peace settlements; the emergence of Nazism and Communism; the development of the Cold War and nuclear weapons; the rise of China, India, and the EU; and the impact of Islamic terrorism. The role of international institutions and international society will also be a focus as will the challenge of environment, health, poverty, and climate issues to the functioning of the system.
HISTORY 147	History of South Africa (Same as AFRICAAM 147, AFRICAAM 47, HISTORY 47, CSRE 174, CSRE 74)	X		Introduction, focusing particularly on the modern era. Topics include: precolonial African societies; European colonization; the impact of the mineral revolution; the evolution of African and Afrikaner nationalism; the rise and fall of the apartheid state; the politics of post-apartheid transformation; and the AIDS crisis.
HISTORY 150A	Colonial and Revolutionary America (Same as AMSTUD 150A, HISTORY 50A)	X		Survey of the origins of American society and polity in the 17th and 18th centuries. Topics: the migration of Europeans and Africans and the impact on native populations; the emergence of racial slavery and of regional, provincial, Protestant cultures; and the political origins and constitutional consequences of the American Revolution.
HISTORY 150B	Nineteenth Century America (Same as HISTORY 50B, AMSTUD 150B, AFRICAAM 150B, AFRICAAM 50B)	X		(Same as HISTORY 150B. History majors and others taking 5 units, register in 150B.) Territorial expansion, social change, and economic transformation. The causes and consequences of the Civil War. Topics include: urbanization and the market revolution; slavery and the Old South; sectional conflict; successes and failures of Reconstruction; and late 19th-century society and culture.
HISTORY 152	History of American Law (Same as HISTORY 352B)	X		(Same as LAW 318.) Modern history of American law, legal thought, legal institutions and the legal profession. Topics include law and regulation of corporate organizations and labor relations in the age of enterprise, law of race relations in the South and North, development of classical legalism, critiques of classical legalism, modern administrative state, organized legal profession, New Deal legal thought and legislation, legal order of the 50s, expansion of enterprise liability, civil rights movements from 1940, rights revolution of the Warren Court and Great Society.
HISTORY 173	Mexican Migration to the United States (Same as HISTORY 73, AMSTUD 73, CHILATST 173)	X		This class examines the history of Mexican migration to the United States. In the United States we constantly hear about Obama's immigration plan, the anti-immigrant laws in Arizona, and the courage of DREAM Activists; in Mexico news sources speak about the role of remittances, the effect of deportations, and the loss of life at the border. Unfortunately, few people truly understand the historical trends in these migratory processes, or the multifaceted role played by the United States in encouraging individuals to head there. Moreover, few people have actually heard the opinions and voices of migrants themselves. This course seeks to provide students with the opportunity to place migrants' experiences in dialogue with migratory laws as well as the knowledge to embed current understandings of Latin American migration in their meaningful historical context.

HISTORY 236E	Planes, Trains, and Automobiles: Transportation, Tourism, and the Making of Modern Europe (Same as FRENCH 217)	X		This course traces a history of how over the past two centuries various innovations in transportation technologies have shaped so much of how our world works: from how we eat, to how we relax, to how we dream, to the houses we live in, to how our financial systems work, and to how new ideas spread.
HISTORY 238	France Since 1900: Politics, Culture, Society (Same as HISTORY 338, FRENCH 259, FRENCH 359)	X		This course explores how France experienced some of the most tumultuous episodes in modern history, including world wars, collaboration and genocide, wars of decolonization, globalization, immigration, and economic decline. Our sources will include a rich combination of novels, films, architecture, and memoirs, including many classics of their chosen genres.
HISTORY 271D	The Country and the City in Colonial Latin America	X		This class considers key questions in the colonial history of Latin America from the perspective of urban and rural development: power, resistance, and colonial rule; religion and culture; the relationship between capital accumulation and agriculture; and the role of intellectuals and regional power bosses.
HISTORY 299X	Preparing for International Field Work: Public Service or Research (Same as HISTORY 399A)	X		Open to students in all classes, those planning internships abroad and those planning research, from juniors with honors theses and sophomores with Chappell Lougee grants to freshmen thinking ahead. Introduces resources on campus for planning international research and service. Raises issues that need to be considered in advance of going abroad: ethical concerns, Human Subjects Protocol, networking, personal safety and gender issues, confronting cultural differences. Exposes students to research methods: case studies, interviewing, working in foreign libraries and archives.
HISTORY 303J	Water in World History (Same as HISTORY 203J)		X	Examines the human relationship to water in various geographical, ecological, technological, cultural and sociopolitical settings, primarily during, but not limited to, the 19th and 20th centuries. Develops a broad historical understanding of the dwindling supply, deteriorating quality and inequitable distribution of freshwater today.
HISTORY 311	Out of Eden: Deportation, Exile, and Expulsion from Antiquity to the Renaissance (Same as HISTORY 211)	X		This course examines the long pedigree of modern deportations and mass expulsions, from the forced resettlements of the ancient world to the expulsion of Jews from Spain in 1492, and from the outlawry of Saga-era Iceland to the culture of civic exile in Renaissance Italy. The course focuses on Europe and the Mediterranean from antiquity to the early modern period, but students are welcome to venture beyond these geographical and chronological boundaries for their final papers.
HISTORY 326E	Famine in the Modern World (Same as HISTORY 226E, PEDS 226)	X		Open to medical students, graduate students, and undergraduate students. Examines the major famines of modern history, the controversies surrounding them, and the reasons that famine persists in our increasingly globalized world. Focus is on the relative importance of natural, economic, and political factors as causes of famine in the modern world. Case studies include the Great Irish Famine of the 1840s; the Bengal famine of 1943-44; the Soviet famines of 1921-22 and 1932-33; China's Great Famine of 1959-61; the Ethiopian famines of the 1970s and 80s, and the Somalia famines of the 1990s and of 2011.
HISTORY 343C	People, Plants, and Medicine: Colonial Science and Medicine (Same as HISTORY 243C)	X		Explores the global exchange of knowledge, technologies, plants, peoples, disease, and medicines. Considers primarily Africans, Amerindians, and Europeans in the eighteenth-century West but also takes examples from other knowledge traditions. Readings treat science and medicine in relation to voyaging, colonialism, slavery, racism, plants, and environmental exchange. Colonial sciences and medicines were important militarily and strategically for positioning emerging nation states in global struggles for land and resources.
HISTORY 389	The Indian Ocean World: Winds, Merchants & Empires (Same as HISTORY 289)	X		Focuses on the Indian Ocean World, a critical historical arena of large-scale cultural and economic contact among societies of South Asia, the Middle East, East and Southeast Asia, and East Africa. We will explore this contact zone chronologically and thematically, examining the influence of environment, the demands of commerce, the bonds of Islam, and the political tensions of empires from medieval to modern times. We will pay particular attention to the networks and individuals that have made up the social fabric of this oceanic world: merchants, pilgrims, smugglers, and laborers. Texts will include scholarly studies as well as travel and fictional accounts.
HISTORY 391B	The City in Imperial China (Same as HISTORY 91B, HISTORY 191B)	X		The evolution of cities in the early imperial, medieval, and early modern periods. Topics include physical structure, social order, cultural forms, economic roles, relations to rural hinterlands, and the contrast between imperial capitals and other cities. Comparative cases from European history. Readings include primary and secondary sources, and visual materials.
HISTORY 448A	Colonial States and African Societies, Part I (Same as HISTORY 248S)	X		Colonialism set in motion profound transformations of African societies. These transformations did not occur immediately following military conquest, nor did they occur uniformly throughout the continent. This research seminar will focus directly on the encounter between the colonial state and African societies. The seminar will examine problems of social transformation, the role of the colonial state, and the actions of Africans. Following four weeks of colloquium style discussion, students then embark on independent research on the encounter between one colonial state and its constituent African societies.
HISTORY 448B	Colonial States and African Societies, Part II (Same as HISTORY 249S)	X		Second part of the research seminar offered in the Winter. Students continue their research and present their penultimate drafts in week 8.

HISTORY 448B	Assessing High Impact Business Models in Emerging Markets	X		In recent years, we've seen an explosion of innovative business models blazing new trails in emerging markets. Many of these models are achieving commercial success while transforming the lives of low-income populations. Using nine cases of both early-stage, entrepreneur-led ventures and later-stage, public or large-cap firms, this course will examine best practices for scaling new enterprises in emerging markets. It will do so primarily through the lens of a potential investor. It will also explore what is required to spark, nurture and scale entire sectors that serve rapidly growing, often low-income markets. What does it mean to work in markets with limited infrastructure? What common mistakes are made - whether in business model design, in supply chains, or in dealing with government - and how can we avoid them? Which are the best business models to serve markets that corporations have traditionally ignored, and in which government has failed to deliver? Who might be threatened by the success of these new businesses? The seminar is a good match for Stanford students interested in working or investing in emerging markets. It will be taught by Matt Bannick, who leads Omidyar Network (a \$1 billion impact investing fund) and is the former President of eBay International and of PayPal.
HISTORY 5C	Human Trafficking: Historical, Legal, and Medical Perspectives (Same as HISTORY 105C, FEMGEN 105C, INTNLREL 105C, CSRE 105C, FEMGEN 5C, HUMBIO 178T, CSRE 5C, EMED 105C, EMED 5C)	X		Interdisciplinary approach to understanding the extent and complexity of the global phenomenon of human trafficking, especially for forced prostitution, labor exploitation, and organ trade, focusing on human rights violations and remedies. Provides a historical context for the development and spread of human trafficking. Analyzes the current international and domestic legal and policy frameworks to combat trafficking and evaluates their practical implementation. Examines the medical, psychological, and public health issues involved. Uses problem-based learning. Students interested in service learning should consult with the instructor and will enroll in an additional course.
HISTORY 6W	Service Learning Workshop on Human Trafficking	X		Considers purpose, practice, and ethics of service learning. Provides training for students' work in community. Examines current scope of human trafficking in Bay Area, pressing concerns, capacity and obstacles to effectively address them. Students work with community partners dedicated to confronting human trafficking and problems it entails on a daily basis.
HRP 235	Designing Research-Based Interventions to Solve Global Health Problems	X		The excitement around social innovation and entrepreneurship has spawned numerous startups focused on tackling world problems, particularly in the fields of education and health. The best social ventures are launched with careful consideration paid to research, design, and efficacy. This course offers students insights into understanding how to effectively develop, evaluate, and scale social ventures. Using TeachAIDS (an award-winning nonprofit educational technology social venture used in 78 countries) as a primary case study, students will be given an in-depth look into how the entity was founded and scaled globally. Guest speakers will include world-class experts and entrepreneurs in Philanthropy, Medicine, Communications, Education, and Technology. Open to both undergraduate and graduate students.
HUMBIO 2A	Genetics, Evolution, and Ecology	X		Introduction to the principles of classical and modern genetics, evolutionary theory, and population biology. Topics: micro- and macro-evolution, population and molecular genetics, biodiversity, and ecology, emphasizing the genetics and ecology of the evolutionary process and applications to human populations. HUMBIO 2A and 2B must be taken concurrently.
HUMBIO 2B	Culture, Evolution, and Society	X		Introduction to the evolutionary study of human diversity. Hominid evolution, the origins of social complexity, social theory, and the emergence of the modern world system, emphasizing the concept of culture and its influence on human differences.
HUMBIO 4B	Environmental and Health Policy Analysis	X		Connections among the life sciences, social sciences, public health, and public policy. The economic, social, and institutional factors that underlie environmental degradation, the incidence of disease, and inequalities in health status and access to health care. Public policies to address these problems. Topics include pollution regulation, climate change policy, biodiversity protection, health care reform, health disparities, and women's health policy. HUMBIO 4A and 4B must be taken concurrently.
HUMBIO 8P	Pre-field Course for Bolivia Impact Abroad in Child Family Health International	X		Enrollment restricted to undergraduates participating in Impact Abroad's Boliva Program. Focus is on understanding service-learning principles and the historical, social and political context of Bolivia's health system.
HUMBIO 25SI	Diverse Perspectives on Disabilities	X		This class investigates definitions and the complexities of life with a disability through discussion and panel based learning. Through student and parent panels, speakers, professors, and professionals in the field of disability, this class looks at the different perspectives and ways that disability interacts with the world. In addition to learning about the scientific, social and legal backgrounds students can also participate in a community volunteering project for an additional unit through Kids with Dreams or another community or student organization
HUMBIO 29A	Well-Being in Immigrant Children & Youth: A Service Learning Course (Same as EDUC 177A, CSRE 177E, CHILATST 177A)	X		This is an interdisciplinary course that will examine the dramatic demographic changes in American society that are challenging the institutions of our country, from health care and education to business and politics. This demographic transformation is occurring first in children and youth, and understanding how social institutions are responding to the needs of immigrant children and youth to support their well-being is the goal of this course.

HUMBIO 113	The Human-Plant Connection		X	The intertwined biologies of humans and plants, particularly the ways in which people and plants have imposed selection pressures and ecological change on one another. Topics include evolution and basic plant structure; plant domestication; effects of agriculture on human health and physiology; plants in traditional and contemporary diets; and human influences on plant biology through genetic manipulation and environmental change. Class meetings center on journal articles. Final project includes written and multimedia presentations.
HUMBIO 118	Theory of Ecological and Environmental Anthropology (Same as ANTHRO 90C)	X		Dynamics of culturally inherited human behavior and its relationship to social and physical environments. Topics include a history of ecological approaches in anthropology, subsistence ecology, sharing, risk management, territoriality, warfare, and resource conservation and management. Case studies from Australia, Melanesia, Africa, and S. America.
HUMBIO 122M	Challenges of Human Migration: Health and Health Care of Migrants and Autochthonous Populations (Same as PEDS 212)	X		An emerging area of inquiry. Topics include: global migration trends, health issues/aspects of migration, healthcare and the needs of immigrants in the US, and migrants as healthcare providers: a new area of inquiry in the US. Class is structured to include: lectures lead by the instructor and possible guest speakers; seminar, discussion and case study sessions led by students.
HUMBIO 122M	Applying Economics: Career Options for Econ Majors	X		Econ majors go on to work for tech giants and startups, big Wall Street firms and nonprofits, legislatures and law firms, academic research and teaching, as well as a variety of "nontraditional" career paths. Each week, this course will bring a remarkable former Econ major back to campus to discuss their career path and how they have applied their econ background in their professional and personal lives. Short background readings on each speaker will be the only assigned work.
HUMBIO 124E	Economics of Infectious Disease and Global Health (Same as MED 236)		X	Introduction to global health topics such as childhood health, hygiene, drug resistance, and pharmaceutical industries from an economic development perspective. Introduces economic concepts including decision-making over time, externalities, and incentives as they relate to health.
HUMBIO 125	Current Topics and Controversies in Women's Health (Same as FEMGEN 256, OBGYN 256)	X		Interdisciplinary. Focus is primarily on the U.S., with selected global women's health topics. Topics include: leading causes of morbidity and mortality across the life course; reproductive (e.g. gynecologic & obstetric) health issues; sexual function; importance of lifestyle (e.g. diet, exercise, weight control), including eating disorders; mental health; sexual and relationship abuse; issues for special populations. In-class Student Debates on key controversies in women's health. Guest lecturers. HUMBIO students must enroll in HumBio 125 for 3 units. PhD minor in FGSS, enroll in FEMGEN 256 for 2 - 3 units and for a letter grade. Med students enroll in OBGYN 256 for 2 units.
HUMBIO 126A	Advanced Seminar in Health and Security	X		In this course, we explore the growing interconnections between health and security. Global health can no longer be addressed without some important consideration of international security as war, civil conflict and political instability have increasingly defined the health challenges in major parts of the world. This course will address the interaction of three types of security: human, national, and international. Health is obviously a component of human security. However, it has also been raised as a concern of national and international security, particularly in areas where HIV/AIDS and Ebola have been prevalent and where the risk of pandemic outbreaks is high. This course will bring together a cross-disciplinary examination of these issues and address the opportunities and potential risks of tightly linking the provision of essential health services to security considerations. We will use case studies to explore both the conceptual and technical issues inherent in health and security. The challenges of Ebola, HIV, complex humanitarian emergencies, and pandemics will be explored in detail. As part of each discussion, the intense interaction of biology, service delivery, political legitimacy, human rights, and international relations will be examined.
HUMBIO 127B	Community Health: Assessment and Planning II	X		Continuation of 127A. Service learning course with emphasis on conducting community health assessment and planning projects in collaboration with community-based organizations. Service Learning Course (certified by Haas Center).
HUMBIO 129S	Global Public Health	X		The class is an introduction to the fields of international public health and global medicine. It focuses on resource poor areas of the world and explores major global health problems and their relation to policy, economic development and human rights. The course is intended for students interested in global health, development studies, or international relations, and provides opportunities for in-depth discussion and interaction with experts in the field.
HUMBIO 154A	Engineering Better Health Systems: modeling for public health (Same as CHPR 254)	X		(HumBio students must enroll in HumBio 154A.)This course teaches operations research and modeling techniques to improve public health programs and disease control systems. Students will engage in in-depth interdisciplinary study of disease detection and control strategies from a "systems science" perspective, which involves the use of common mathematical modeling and operations research techniques such as optimization, queuing theory, Markov and Kermack-McKendrick models, and microsimulation. Lectures and problem sets will focus on applying these techniques to classical public health dilemmas such as how to optimize screening programs, reduce waiting times for healthcare services, solve resource allocation problems, and compare macro-scale disease control strategies that cannot be easily evaluated through randomized trials. Readings will complement the lectures and problem sets by offering critical perspectives from the public health history, sociology, and epidemiology. In-depth case studies from non-governmental organizations, departments of public health, and international agencies will drive the course. Open to upper-division undergraduate students.

HUMBIO 158S	Genetics and Society (Same as EDUC 373, SOC 232)	X		This course will focus on social science engagement with developments in genetic research, focusing on two key issues. First, social scientists are trying to figure out how genetic data can be used to help them better understand phenomena they have been long endeavoring to understand. Second, social scientists try to improve understanding of how social environments moderate, amplify, or attenuate genetic influences on outcomes.
HUMBIO 159	Genes and Environment in Disease Causation: Implications for Medicine and Public Health (Same as HRP 238)	X		The historical, contemporary, and future research and practice among genetics, epidemiology, clinical medicine, and public health as a source of insight for medicine and public health. Genetic and environmental contributions to multifactorial diseases; multidisciplinary approach to enhancing detection and diagnosis. The impact of the Human Genome Project on analysis of cardiovascular and neurological diseases, and cancer. Ethical and social issues in the use of genetic information.
HUMBIO 166	Food and Society: Exploring Eating Behaviors in Social, Environmental, and Policy Context (Same as CHPR 166)	X		The material in this course is an introduction to the field and the target audience is undergraduates. It may be of interest to graduate students unfamiliar with the field. The class examines the array of forces that affect the foods human beings eat, and when, where, and how we eat them, including human labor, agriculture, environmental sustainability, politics, animal rights/welfare, ethics, policy, culture, economics, business, law, trade, and ideology, and psychology. The class addresses the impact of current policies and actions that might be taken to improve human nutrition and health; macro-scale influences on food, nutrition, and eating behavior. . Undergraduate Prerequisite: Human Biology Core or equivalent or consent of instructor.
HUMBIO 170	The World Is Flat, The Sun Revolves Around The Earth, and Alternative Facts	X		The role of science in civil rights, justice, policy, criminal justice, evidence, education, and disabled rights. Prerequisite: Human Biology Core or equivalent or consent of instructor.
HUMBIO 175H	Literature and Human Experimentation (Same as AFRICAAM 223, COMPLIT 223, CSRE 123B, MED 220)	X		This course introduces students to the ways literature has been used to think through the ethics of human subjects research and experimental medicine. We will focus primarily on readings that imaginatively revisit experiments conducted on vulnerable populations: namely groups placed at risk by their classification according to perceived human and cultural differences. We will begin with Mary Shelley's Frankenstein (1818), and continue our study via later works of fiction, drama and literary journalism, including Toni Morrison's Beloved, David Feldshuh's Miss Evers Boys, Hannah Arendt's Eichmann and Vivien Spitz's Doctors from Hell, Rebecca Skloot's Immortal Life of Henrietta Lacks, and Kazuo Ishiguro's Never Let Me Go. Each literary reading will be paired with medical, philosophical and policy writings of the period; and our ultimate goal will be to understand modes of ethics deliberation that are possible via creative uses of the imagination, and literature's place in a history of ethical thinking about humane research and care.
HUMBIO 182	Peopling of the Globe: Changing Patterns of Land Use and Consumption Over the Last 50,000 Years (Same as ANTHRO 18, ARCHLGY 12, EARTHYSYS 21)		X	Fossil, genetic and archaeological evidence suggest that modern humans began to disperse out of Africa about 50,000 years ago. Subsequently, humans have colonized every major landmass on earth. This class introduces students to the data and issues regarding human dispersal, migration and colonization of continents and islands around the world. We explore problems related to the timing and cause of colonizing events, and investigate questions about changing patterns of land use, demography and consumption. Students are introduced to critical relationships between prehistoric population changes and our contemporary environmental crisis.
HUMBIO 127A	Community Health: Assessment and Planning I	X		Major determinants of health in a community. Working with community partners to identify health issues and plan programs and policies to prevent disease and promote health. Service learning component involving students in community health assessment techniques. Final grade given upon completion of HUMBIO 127B. Service Learning Course (certified by Haas Center).
HUMRTS 101	Cross-Disciplinary Perspectives on Human Rights Theory and Practice	X		In this survey human rights course, students will learn about how the distinct methodologies, assumptions, and vocabulary of particular disciplinary communities affect the way scholars and practitioners trained in these fields approach, understand, and employ human rights concepts. We will discuss the principal historical and philosophical bases for the modern concept of human rights, as well as the international legal frameworks meant to protect and promote these rights. Class sessions will include a mix of seminar discussions and guest lectures by distinguished Stanford faculty from across the university. This course fulfills the gateway course requirement for the minor in Human Rights. HUMRTS 101 was previously listed as GLOBAL 105.
ILAC 133	The Animal Within: Animals in Modern and Contemporary Latin American Narrative	X		How does the criterion for the division between the human and the animal take part on contemporary Latin American narrative? To what extent is this divide challenged or contested? How do animals behave in literary spaces? The course combines a discussion of the literary works of authors like Jorge Luis Borges, Horacio Quiroga, Julio Cortázar, Mario Bellatin, Graciliano Ramos, Clarice Lispector, and José María Arguedas with a reflection on the animal and animality in the writings of Derrida, Deleuze, and Haraway. Taught in Spanish.
ILAC 246	Critical Issues of Human Rights through Literature	X		This course seeks to explain some of the most relevant contemporary problems of contemporary human rights through the eyes of literature. Through novels, the course problematizes some issues of human rights that, from a legal perspective, are simplified or captured merely through legal forms i.e. rules. These novels highlight the social and political tensions involved in the rise of human rights and in some of its most urgent problems during their short history. Human rights legal forms generally simplify a wider array of tensions that this course brings to the foreground. Taught in Spanish. INSTRUCTOR: Jorge González-Jacome

ILAC 348	US-Mexico Border Fictions: Writing La Frontera, Tearing Down the Wall (Same as COMPLIT 348)	X		A border is a force of containment that inspires dreams of being overcome, crossed, and cursed; motivates bodies to climb over walls; and threatens physical harm. This graduate seminar places into comparative dialogue a variety of perspectives from Chicana/o and Mexican/Latin American literary studies. Our seminar will examine fiction and cultural productions that range widely, from celebrated Mexican and Chicano/a authors such as Carlos Fuentes ( <i>La frontera de cristal</i> ), Yuri Herrera ( <i>Señales que precederán al fin del mundo</i> ), Willivaldo Delgado ( <i>La Virgen del Barrio Árabe</i> ), Américo Paredes ( <i>George Washington Gómez: A Mexico-Texan Novel</i> ), Gloria Anzaldúa ( <i>Borderlands/La Frontera: The New Mestiza</i> ), and Sandra Cisneros ( <i>Carmelo: Puro Cuento</i> ), among others, to musicians whose contributions to border thinking and culture have not yet been fully appreciated such as Herb Albert, Ely Guerra, Los Tigres del Norte, and Café Tacvba. Last but not least, we will screen and analyze Orson Welles' iconic border films <i>Touch of Evil</i> and Rodrigo Dorfman's <i>Los Sueños de Angélica</i> .nnProposing a diverse and geographically expansive view of the US-Mexico border literary and cultural studies, this seminar links the work of these authors and musicians to struggles for land and border-crossing rights, anti-imperialist forms of trans-nationalism, and to the decolonial turn in border thinking or pensamineto fronterizo. It forces us to take into account the ways in which shifts in the nature of global relations affect literary production and negative aesthetics especially in our age of (late) post-industrial capitalism.
INTNLREL 135A	International Environmental Law and Policy		X	This course addresses the nature, content, and structure of international environmental law. We will discuss its sources (formal and informal) and general principles, along with the emerging principles (sustainable development, precautionary principle, etc.) We will evaluate the role of international and non-governmental organizations, as well as examine the negotiation, conclusion, and implementation of international environmental agreements. Problem areas to be examined include global warming, stratospheric ozone depletion, exports of hazardous substances, transboundary pollution, trade and environment, and development and environment. RECOMMENDED PREREQ: students have completed INTNLREL 1 and/or INTNLREL 140A
INTNLREL 140C	The U.S., U.N. Peacekeeping, and Humanitarian War (Same as HISTORY 201C)	X		The involvement of U.S. and the UN in major wars and international interventions since the 1991 Gulf War. The UN Charter's provisions on the use of force, the origins and evolution of peacekeeping, the reasons for the breakthrough to peacemaking and peace enforcement in the 90s, and the ongoing debates over the legality and wisdom of humanitarian intervention. Case studies include Croatia and Bosnia, Somalia, Rwanda, Kosovo, East Timor, and Afghanistan. * Course satisfies the WiM requirement for International Relations majors.
INTNLREL 141A	Animal Law	X		All nonhuman animals have been legal things that lack the capacity for legal rights for centuries. The struggle to extend legal personhood, which is the capacity to possess legal rights, to at least some nonhuman animals has turned to the courts. Lawsuits alleging that a captive nonhuman animal is a legal person entitled to her bodily liberty pursuant to common law or civil law habeas corpus have been litigated, and continue to be litigated, in the United States, Argentina, Brazil, and Costa Rica. We will study what legal rights are, where they come from, and why humans have sometimes lacked them, as well as some of those lawsuits, the grounds they allege and the arguments they make, and arguments made against them by their critics.
INTNLREL 142	Challenging the Status Quo: Social Entrepreneurs Advancing Democracy, Development and Justice (Same as AFRICAST 142, AFRICAST 242)	X		This seminar is part of a broader program on Social Entrepreneurship at CDDRL in partnership with the Haas Center for Public Service. It will use practice to better inform theory. Working with three visiting social entrepreneurs from developing and developed country contexts students will use case studies of successful and failed social change strategies to explore relationships between social entrepreneurship, gender, democracy, development and justice. It interrogates current definitions of democracy and development and explores how they can become more inclusive of marginalized populations. This is a service learning class in which students will learn by working on projects that support the social entrepreneurs' efforts to promote social change. Students should register for either 3 OR 5 units only. Students enrolled in the full 5 units will have a service-learning component along with the course. Students enrolled for 3 units will not complete the service-learning component. Limited enrollment. Attendance at the first class is mandatory in order to participate in service learning.
IPS 201	Managing Global Complexity	X		Is international relations theory valuable for policy makers? The first half of the course will provide students with a foundation in theory by introducing the dominant theoretical traditions and insights in international relations. The second half of the course focuses on several complex global problems that cut across policy specializations and impact multiple policy dimensions. Students will assess the value of major theories and concepts in international relations for analyzing and addressing such complex global policy issues.
IPS 203	Issues in International Economics	X		Topics in international trade and international trade policy: trade, growth and poverty, the World Trade Organization (WTO), regionalism versus multilateralism, the political economy of trade policy, trade and labor, trade and the environment, and trade policies for developing economies.
IPS 210	The Politics of International Humanitarian Action	X		The relationship between humanitarianism and politics in international responses to civil conflicts and forced displacement. Focus is on policy dilemmas and choices, and the consequences of action or inaction. Case studies include northern Iraq (Kurdistan), Bosnia, Rwanda, Kosovo, and Darfur. In addition to class attendance, each student will meet with the instructor for multiple one-on-one sessions during the quarter.

IPS 224	Economic Development and Challenges of East Asia (Same as ECON 124)	X		<p>This course explores East Asia's rapid economic development and the current economic challenges. For the purpose of this course, we will focus on China, Japan, and Korea. The first part of the course examines economic growth in East Asia and the main mechanisms. In this context, we will examine government and industrial policy, international trade, firms and business groups, and human capital. We will discuss the validity of an East Asian model for economic growth. However, rapid economic growth and development in East Asia was followed by economic stagnation and financial crisis. The second part of the course focuses on the current economic challenges confronting these countries, in particular, inequality, demography, and entrepreneurship and innovation. Readings will come from books, journal articles, reports, news articles, and case studies. Many of the readings will have an empirical component and students will be able to develop their understanding of how empirical evidence is presented in articles.</p>
IPS 246	China on the World Stage	X		<p>China's reemergence as a global player is transforming both China and the international system. Other nations view China's rise with a mixture of admiration, anxiety, and opportunism. Some welcome China's rise as a potential counterweight to US preeminence; others fear the potential consequences of Sino-American rivalry and erosion of the US-led international system that has fostered unprecedented peace and prosperity. This course provides an overview of China's engagement with countries in all regions and on a wide range of issues since it launched the policy of opening and reform in 1978. The goal is to provide a broad overview and systematic comparisons across regions and issues, and to examine how China's global engagement has changed over time.</p>
IPS 270	The Geopolitics of Energy		X	<p>The global energy landscape is undergoing seismic shifts with game-changing economic, political and environmental ramifications. Technological breakthroughs are expanding the realms of production, reshuffling the competition among different sources of energy and altering the relative balance of power between energy exporters and importers. The US shale oil and gas bonanza is replacing worries about foreign oil dependence with an exuberance about the domestic resurgence of energy-intensive sectors. China's roaring appetite for energy imports propels its national oil companies to global prominence. Middle Eastern nations that used to reap power from oil wealth are bracing for a struggle for political relevance. Many African energy exporters are adopting promising strategies to break with a history dominated by the "resource curse." This course provides students with the knowledge, skill set and professional network to analyze how the present and past upheavals in oil and gas markets affect energy exporters and importers, their policymaking, and their relative power. Students will gain a truly global perspective thanks to a series of exciting international guest speakers and the opportunity to have an impact by working on a burning issue for a real world client. Satisfies the IPS Policy Writing Requirement.</p>
IPS 275	UN Habitat III: Bridging Cities and Nations to Tackle Urban Development	X		<p>From climate change to refugee housing, cities have powered into an expanding role in international affairs, helping national governments navigate critical global challenges. Every twenty years, the world convenes at the United Nations Conference on Housing and Sustainable Urban Development (HABITAT) to debate human settlement and collectively redraw our urban future. Using HABITAT III in Quito as a lens, we explore urban growth and governance; technology and finance; environmental and cultural sustainability; international negotiations and multilateral cooperation. Includes independent research on themes from HABITAT III and the New Urban Agenda.</p>
LATINAM 92	Volunteers in Latin America: Pre-Field Reading and Discussion	X		<p>A pre-field seminar for students participating in the Volunteers in Latin America summer program in Quito, Ecuador. The seminar will introduce students to topics of international service, youth development, and the issues and challenges surrounding street children in Ecuador. The seminar seeks to provide participants with a cultural, socioeconomic, and political context in which to understand the experiences they will have when in Ecuador. Through discussions, guest speaker presentations, and readings, students will develop insights and further questions that will help them to be more confident, reflective, and empathetic participants in their in-country service learning experience. Course enrollment is restricted to those students that have committed to the summer program.</p>
LATINAM 207	Spanish in Science/Science in Spanish (Same as EARTHSYS 207, BIO 208)		X	<p>For graduate and undergraduate students interested in the natural sciences and the Spanish language. Students will acquire the ability to communicate in Spanish using scientific language and will enhance their ability to read scientific literature written in Spanish. Emphasis on the development of science in Spanish-speaking countries or regions. Course is conducted in Spanish and intended for students pursuing degrees in the sciences, particularly disciplines such as ecology, environmental science, sustainability, resource management, anthropology, and archeology.</p>

LATINAM 248	Racial and Gender Inequalities in Latin America	X		This course explores the intersection between racial and gender inequalities in Latin America focusing on the historical pattern of racism, sexism and discrimination, and on the political and social changes that have enabled Afro-descendants and women to achieve social rights in some countries of the region such as Brazil, Colombia, Ecuador, and Uruguay. The first part of this course introduces the struggle of political movements taking into consideration the historical process of race and gender discrimination. It will address not only the history of blacks and women's movements in the 20th century, but also racism and sexism as cultural and institutional elements that configure inequality in those countries. Socio-economic indicators, race and gender-based violence, and political participation will be analyzed. The second part of this course examines the most recent discourses about women and afro-descendant rights, and their political framework. It evaluates how they have changed public opinion, laws and the social, institutional and political environment of Latin America. Finally, this course discusses the ability of Afro-descendants and women movements to navigate in the current political climate and advance their rights. <u>Course will be taught in</u>
LATINAM 337A	Indigenous Peoples, Environment and Sustainability		X	"Why be concerned with indigenous peoples and their environments? After all, these people are few in number and have little influence on the environment." (Fragoso and Reo 2013). Many believe this statement to be true and suggest that indigenous societies are similar to other human societies in their relationships and impacts on the environment. Supporters of this view argue that extant indigenous people have transitioned or are transitioning into the dominant "westernized" world culture, negating any special relationship they may have had with biota and the environment. However, interactions among groups of people, biota, and geographies are inherently complex, making it difficult to tease apart reality from myth and sustainability from unsustainability. Through a series of lectures, readings, and discussions of case studies from the Americas and the world (with a slight focus on the Amazon) we will explore indigenous peoples views of and interactions with biota and the environment. We will also examine how culture influences ecology and sustainability and explore the tension that exists between science and traditional ways of knowing. Course will span two quarters (Winter and Spring) and students must enroll in both quarters.
LATINAM 337B	Indigenous Peoples, Environment, and Sustainability (Part II)		X	"Why be concerned with indigenous peoples and their environments? After all, these people are few in number and have little influence on the environment." (Fragoso and Reo 2013). Many believe this statement to be true and suggest that indigenous societies are similar to other human societies in their relationships and impacts on the environment. Supporters of this view argue that extant indigenous people have transitioned or are transitioning into the dominant "westernized" world culture, negating any special relationship they may have had with biota and the environment. However, interactions among groups of people, biota, and geographies are inherently complex, making it difficult to tease apart reality from myth and sustainability from unsustainability. Through a series of lectures, readings, and discussions of case studies from the Americas and the world (with a slight focus on the Amazon) we will explore indigenous peoples views of and interactions with biota and the environment. We will also examine how culture influences ecology and sustainability and explore the tension that exists between science and traditional ways of knowing. Course will span two quarters (Winter and Spring) and students must enroll in both quarters.
LAW 681Z	Human Rights Stories	X		In this discussion seminar, we will examine ethical dilemmas in the area of international human rights and international humanitarian law. Materials will include a mix of films, biographies, and non-fiction works. No prior knowledge of international law is required.
LAW 681Z	Coastal Forest Ecosystems	X		Prehistory of Australian rainforest and how rainforest structure and biodiversity change with altitude, latitude, and geology. Tropical coastal marine wetlands, mangrove forests, and the relationship between land- and sea-based biota. Biology and ecology of marine plants, mangroves, and tropical salt marsh. Introduction to specialized fields of marine plant biology and ecology including biogeography and evolution, aquatic plant ecophysiology, water quality and bioindicator techniques, pollution and eutrophication, and environmental control of marine plant distribution and productivity.
LAW 1015	Corporate Social Responsibility	X		Although corporate social responsibility ("CSR") initiatives have been pursued by a range of companies as voluntary measures for decades, recent developments have rendered the exercise by companies of designing and implementing environmental, social and governance mechanisms inherently legal in nature. This course will explore the legal issues that companies have been forced to confront, increasingly with the support of specialized legal counsel, in pursuing CSR or sustainability objectives, including those arising in the context of supply chain human rights due diligence (e.g., minerals sourcing and human trafficking), impact investment and the adoption of alternative corporate forms, voluntary standards and mandatory requirements regarding non-financial disclosure and reporting (e.g., SASB, sustainability listing standards, possible amendments to Regulation S-K, and the EU non-financial reporting rules), director fiduciary duties and the changing expectations of investors, shareholder proposals and stakeholder engagement, and the rise of corporate social activism by companies and their officers, among others. Elements used in grading: Class Participation, Written Assignments, Final Paper.

LAW 2502	Climate Change Policy: Economic, Legal, and Political Analysis	X		<p>This course will advance students' understanding of economic, legal, and political approaches to avoiding or managing the problem of global climate change. Beyond focusing on economic issues and legal constraints, it will address the political economy of various emissions-reduction strategies. The course will consider policy efforts at the local, national, and international levels. Theoretical contributions as well as empirical analyses will be considered. Specific topics include: interactions among overlapping climate policies and between new policies and pre-existing legal or regulatory frameworks; the role that jurisdictional or geographic scale can play in influencing the performance of climate policy approaches; and numerical modeling and statistical analyses of climate change policies.</p>
LAW 2502	Art and Social Criticism (Same as AMSTUD 102, ARTHIST 162B, CSRE 102A, FEMGEN 102)	X		<p>Visual artists have long been in the forefront of social criticism in America. Since the 1960s, various visual strategies have helped emergent progressive political movements articulate and represent complex social issues. Which artists and particular art works/projects have become key anchors for discourses on racism, sexism, economic and social inequality, and immigrant rights? We will learn about a spectrum of political art designed to raise social awareness, spark social change and rouse protest. The Art Workers' Coalition's agit-prop opposing the Vietnam War and ACT-UP's emblematic signs and symbols during the AIDS/HIV crisis of the 1980s galvanized a generation into action. Works such as Judy Chicago's <i>The Dinner Party</i> (1979), Fred Wilson's <i>Mining the Museum</i> (1992), and Glenn Ligon's paintings appropriating fragments from African-American literature all raised awareness by excavating historical evidence of the long legacy of marginalization and modeled ways of resisting that marginalization. For three decades feminist artists Barbara Kruger and the Guerilla Girls have combined institutional critique and direct address into a provocative form of criticality. Recent art for social justice is reaching ever broadening publics by redrawing the role of artist and audience exemplified by the democratization of poster making and internet campaigns of the Occupy and #BlackLivesMatter movements. Why are each of these examples successful as influential and enduring markers of social criticism? We will also consider the visual culture of new protest strategies in the Post-Occupy era. What have these socially responsive practices contributed to our understanding of American history? We will conclude with an investigation into large-scale transnational participatory projects, including Tania Bruguera's <i>Immigrant Movement International</i> and Ai Weiwei's <i>@Large on Alcatraz Island</i>.</p>
LAW 2503	Energy Law		X	<p>The supply of a reliable, low-cost and clean energy supply for the United States is a key determinant of current and future prosperity. Perhaps as a result, electric utilities are among the most heavily regulated of large firms. This statutory and regulatory framework is composed of a complex patchwork of overlapping state and federal rules that is constantly evolving to meet emerging challenges to the energy system. In this course, students will acquire a basic understanding of the law of rate-based regulation of utilities. We will then examine the history of natural gas pipeline regulation in the United States, concluding with the introduction of market competition into US natural gas markets and the advent of shale gas. Next, we will cover the basics of the electricity system, including consumer demand, grid operations, and power plant technologies and economics. We will then revisit cost of service rate regulation as it has been applied in the electricity context. Next we will examine reform of both rate-regulated and wholesale market-based structures, focusing on various attempts to introduce market competition into aspects of the industry and to strengthen incentives for utility investment in energy efficiency. Finally, students will examine various approaches to subsidization of utility scale renewable energy and the growth of distributed energy. Throughout, the course will focus on the sometimes cooperative, sometimes competing, but ever evolving federal and state roles in regulating the supply of electric power.</p>
LAW 2504	Environmental Law and Policy		X	<p>This course provides an introduction to federal environmental law, regulation, and policy in the United States. The course emphasizes the cooperative and competing roles that the federal and state governments play in implementing environmental law in the United States. The course encourages students to adopt a comparative and dynamic view of environmental protection under U.S. law. We begin with a discussion of the property law roots of environmental law. Next we briefly touch on some aspects of U.S. administrative law that are essential to understanding the material that follows (students should feel free to take this class without having taken Administrative Law). This is followed by a discussion of the risk assessment and cost-benefit frameworks essential to understanding the current U.S. approach to environmental problems. We conclude this segment with a comparison of two approaches to chemical safety regulation - the U.S. Toxic Substances Control Act and the EU REACH directive. Next, we focus on three key substantive federal environmental statutes: the Clean Air Act, the Clean Water Act, and the Endangered Species Act. Next, we turn to the National Environmental Policy Act to understand how environmental concerns are included in the process of making agency decisions. The course concludes with a discussion of current EPA efforts to address emissions of greenhouse gases under the Clean Air Act.</p>

LAW 2506	Sustainable Management of Natural Resources		X	Natural resource management presents extremely difficult and contentious issues of law and public policy. Major debates continue to rage over issues such as the Endangered Species Act, whether the United States should permit drilling in the Arctic National Wildlife Refuge, and how to prevent the overfishing of the oceans. This course will focus on two major aspects of natural-resource management: biodiversity protection (including the Endangered Species Act, ocean fisheries management, and global protection of marine mammals) and public lands in the United States such as national parks and wilderness areas. The course also will examine the National Environmental Protection Act and the effectiveness of environmental impact assessments. Class sessions will include critical examinations of current law and policy and in-depth discussions of situational case studies that force you to consider how you would resolve real-life issues. Students will be expected to participate actively in class discussions. (This course will not examine either water law or energy law in any depth. Water Law will be offered again in the 2015-2016 academic year. Several other courses in the Law School deal with energy-law questions.)
LAW 2508	The Business of Water (Same as CEE 273B)		X	One of the fastest growing economic sectors is the water field, and private water companies are playing an increasingly important role in improving water management around the world. In some cases, however, the involvement of private companies in the water sector has also proven controversial (e.g., when private companies have taken over public water supply systems in developing countries such as Bolivia). This course will look at established or emerging businesses in the water sector and the legal, economic, and social issues that they generate. These businesses include investor-owned water utilities, water technology companies (e.g., companies investing in new desalination or water recycling technologies), water-right funds (who directly buy and sell water rights), social impact funds, innovative agricultural operations, water concessionaires, and infrastructure construction companies and investors. Each week will focus on a different business and company. Company executives will attend the class session and discuss their business with the class. In most classes, we will examine (1) the viability and efficacy of the company's business plan, (2) the legal and/or social issues arising from the business' work, and (3) how the business might contribute to improved water management and policy. Each student will be expected to write (1) two short reflection papers during the course of the quarter on businesses that present to the class, and (2) a 15-page paper at the conclusion of the class on either a water company of the student's choice or a policy initiative that can improve the role that business plays in improving water management (either in a particular sector or more generally).
LAW 2509	Clean Energy Project Development and Finance (Same as GSBGEN 335)		X	This case study-oriented course will focus on the critical skills needed to evaluate, develop, finance (on a non-recourse basis), and complete standalone energy and infrastructure projects. The primary course materials will be documents from several representative projects - e.g., solar, wind, storage, carbon capture, transmission, combined heat & power - covering key areas including market and feasibility studies, environmental permitting and regulatory decisions, financial disclosure from bank and bond transactions, and construction, input, and offtake contracts. For virtually every clean energy project, legal documents and financial/business models tend to highly customized. By examining actual projects and transactions we can learn how developers, financiers, and lawyers work to get deals over the finish line--deals that meet the demands of the market, the requirements of the law, and (sometimes) broader societal goals, in particular climate change, economic competitiveness, and energy security.
LAW 2518	U.S. Environmental Law in Transition	X		This course offers an accessible survey of timely topics in environmental law and policy as the United States transitions presidential administrations. Taught by two practicing lawyers, the class introduces students from any background to the interactions between local, state, and federal environmental law as they apply to critical policy issues. We will analyze major changes in federal policy, providing historical context for the transformations now underway in the laws and institutions that shape environmental outcomes in the United States.
LAW 3512	Markets, Morals and the Law	X		What things should or should not be for sale - and why? This course will consider several examples of "blocked exchanges" or "contested commodities," including the trade in reproductive services, body parts, environmental resources, political rights and obligations, and the varieties of human labor. With readings drawn from law, philosophy, and moral and political economy, the purpose of the course will be to examine a range of contemporary controversies over commodification and to consider arguments about the appropriate scope and limits of market activity. The assigned reading will be substantial, varied, and demanding.
LAW 3514	Law and Inequality (Reading Group)	X		This reading group will focus on recent scholarship on law and inequality. In addition to exploring evidence of the rise of economic inequality over the last few decades (including the work of Thomas Piketty, Anthony Atkinson and others), we will study legal scholarship that seeks to understand law's contribution to inequality and to its possible amelioration.
LAW 4014	Law, Technology, and Liberty	X		New technologies from gene editing to networked computing have already transformed our economic and social structures and are increasingly changing what it means to be human. What role has law played in regulating and shaping these technologies? And what role can and should it play in the future? This seminar will consider these and related questions, focusing on new forms of networked production, the new landscape of security and scarcity, and the meaning of human nature and ecology in an era of rapid technological change. Readings will be drawn from a range of disciplines, including science and engineering, political economy, and law. The course will feature several guest speakers. There are no formal prerequisites in either engineering or law, but students should be committed to pursuing novel questions in an interdisciplinary context.

LAW 5001	China Law and Business	X		This introductory course provides an overview of the Chinese legal system and business environment and examines Chinese legal rules and principles in select business-related areas. These areas include intellectual property, dispute resolution, foreign investment vehicles, mergers and acquisitions, antimonopoly law, and environment. Through active class participation and analysis of legal and business cases, students will learn both the law in the books and the law in action, as well as strategies that businesses could use to overcome limitations in the Chinese legal system. Leaders from the law and business community will be invited to share their experiences and insights. This course is particularly suitable for law students and students enrolled in the MBA program and/or the East Asian Studies Program.
LAW 5009	International Conflict Resolution	X		This seminar examines the challenges of managing and resolving intractable political and violent intergroup and international conflicts. Employing an interdisciplinary approach drawing on social psychology, political science, game theory, and international law, the course identifies various tactical, psychological, and structural barriers that can impede the achievement of efficient solutions to conflicts. We will explore a conceptual framework for conflict management and resolution that draws not only on theoretical insights, but also builds on historical examples and practical experience in the realm of conflict resolution. This approach examines the need for the parties to conflicts to address the following questions in order to have prospects of creating peaceful relationships: (1) how can the parties to conflict develop a vision of a mutually bearable shared future; (2) how can parties develop trust in the enemy; (3) how can each side be persuaded, as part of a negotiated settlement, to accept losses that it will find very painful; and (4) how do we overcome the perceptions of injustice that each side are likely to have towards any compromise solution? We will consider both particular conflicts, such as the Israeli-Palestinian conflict and the South African transition to majority rule, as well as cross-cutting issues, such as the role international legal rules play in facilitating or impeding conflict resolution, the intragroup dynamics that affect intergroup conflict resolution efforts, and the role of criminal accountability for atrocities following civil wars.
LAW 5010	International Human Rights	X		This course examines the law of international human rights, analyzing various categories of rights, from civil and political human rights, to social and economic human rights, to group and collective rights. It studies the structure and processes of international and regional courts that adjudicate human rights claims and international treaty bodies that report on State human rights action. It explores debates about the normative justifications for human rights, and whether and how these debates impact upon the application and enforcement of human rights.
LAW 5010	Coral Reef Ecosystems	X		Key organisms and processes, and the complexity of coral reef ecosystems. Students explore the Great Barrier Reef from the southern end which demonstrates the physical factors that limit coral reefs, to the northern reef systems which demonstrate key aspects of these high biodiversity ecosystems. Human-related changes. Emphasis is on research experiences and development of analytical skills.
LAW 5018	Legal Institutions and Global Economic Development	X		This course will cover readings on the relationship between legal institutions and economic development across different countries. Some topics are set by the instructor, while others arise depending on the interests of students as they develop their paper topics. Topics in the past have included the role of legal and colonial origins, rights in property and contract, natural resources, political stability, governance/corruption, and social and economic rights. Readings will emphasize both broad themes and policy in these areas, with a special emphasis on considering varieties of evidence, including case studies, comparative history, statistical studies with observational data, and field experiments.
LAW 5021	Current Topics in International Economic Law	X		This seminar will explore select topics in international economic law, including but not limited to: the formation of new free trade agreements (in particular the proposed Pacific and Atlantic partnerships); the inclusion of "next generation" issues into trade agreements; the expanding use of investment arbitration; the architecture of the Eurozone in relation to recent European Union jurisprudence and policy; and the global regulation of cross-border financial flows. An introductory course in international trade law (or equivalent preparation) is prerequisite. In addition to a final paper, students will be expected to produce weekly reading responses.
LAW 7003	Cities in Distress	X		In 2013, the City Detroit became the 28th city to declare municipal bankruptcy or to enter a receivership for fiscal crisis since late 2008, marking a window of time that saw five of the six largest municipal bankruptcies in American history. Despite the end of the Great Recession, serious fiscal challenges remain for many urban and rural local governments. This course will focus on these places and what they need from state and local government. Rather than a survey of municipal bankruptcy or restructuring law, the course will function as a seminar on state and local governance in the face of decline and poverty, especially due to the loss and automation of industrial employment. Subjects will include: (1) the basics of local finance; (2) an introduction to the primary causes of local fiscal distress; (3) tools for state and federal governance of city finances and financial distress (including municipal bankruptcy and state receiverships); and (4) the local public sector's role in anti-poverty work. The course will feature readings focused on places (both urban and rural) across the country, including in California, Oregon, the Northeast, the Great Lakes/Rust Belt region, and the Appalachian region.

LAW 7018	Disability Law	X		This is a survey course of disability rights law, with an emphasis on federal and state statutes and case law, and some exposure to international human rights law. Areas of concentration are employment, government services, public accommodations, education, housing, mental health treatment and involuntary commitment, and personal autonomy. We will review such statutes as the Americans with Disabilities Act (ADA), Rehabilitation Act (Sec. 504), Individuals with Disabilities Education Act (IDEA), Fair Housing Act Amendments, and the UN Convention on the Rights of Persons with Disabilities. The course examines disability from a civil and human rights perspective.
LAW 7019	Employment Discrimination	X		This course will examine legal responses to the barriers to workplace equality that are faced by minority groups. The course will survey the relevant doctrine, focusing primarily on federal employment discrimination statutes, but also addressing more expansive antidiscrimination protections under some state statutes, and local ordinances. Covered topics include sexual and racial harassment, sexual orientation discrimination, and affirmative interventions aimed at increasing the minority group and/or female representation in certain job categories or segments of the labor market. In addition to surveying the doctrine as it stands and as it has developed over time, we will also explore the doctrinal and conceptual difficulties inherent in identifying invidious discrimination and in devising appropriate remedies.
LAW 7020	Ethics On the Edge: Business, Non-Profit Organizations, Government, and Individuals	X		The objective of the course is to explore the increasing ethical challenges in a world in which technology, global risks, and societal developments are accelerating faster than our understanding can keep pace. We will unravel the factors contributing to the seemingly pervasive failure of ethics today among organizations and leaders across all sectors: business, government and non-profit. A framework for ethical decision-making underpins the course. The relationship between ethics and culture, global risks (poverty, cyber-terrorism, climate change, etc.) leadership, law and policy will inform discussion. Prominent guest speakers will attend certain sessions interactively. A broad range of international case studies might include: Zika virus; civilian space travel (Elon Musk's Mars plans); Facebook's news algorithms; free speech on University campuses (and Gawker type cases); designer genetics; artificial intelligence; Brexit; ISIS' interaction with international NGOs; corporate and financial sector scandals (Epi pen pricing, Wells Fargo, Volkswagen emissions testing manipulation); and non-profit sector ethics challenges (e.g. should NGOs engage with ISIS). Final project in lieu of exam on a topic of student's choice. Attendance required. Class participation important (with multiple opportunities to earn participation credit beyond speaking in class). Strong emphasis on rigorous analysis, critical thinking and testing ideas in real-world contexts.
LAW 7024	Food Law and Policy	X		This seminar explores legal and policy issues related to our food system, including the regulation of food supply, food safety, nutrition / obesity, marketing / labeling, security, and animal treatment. We will examine how laws and regulations affect the production, distribution, sale, and consumption of food and whether particular regulatory approaches (e.g., product bans, product standards, government subsidies, taxes, information disclosure, or labeling) are more effective in achieving public goals.
LAW 7026	Immigration Law, Policy and Constitutional Rights	X		This survey course will provide a foundation in immigration law, the system of admission and removal, and the constitutional principles governing the regulation and rights of noncitizens. The course will also explore selected contemporary topics concerning immigrants' rights and immigration reform drawing on the instructor's extensive experience litigating constitutional and civil rights issues on behalf of noncitizens and recent service as a senior immigration advisor in the Obama administration. We will examine such current issues as immigration detention; state and local regulation of immigrants; constitutional prohibitions on 'alienage' discrimination; access to federal court to challenge removal orders; the intersection of criminal and immigration law; and recent federal reforms, including deferred action initiatives. Guest speakers may be invited for some topics. No prior course or background in
LAW 7034	Race and Public Education	X		From at least Brown v. Board of Education, and many would say before that, education has been central to racial justice movements in America. More than fifty years after Brown, most American schools remain segregated by race and class, and many advocates still argue that the struggle for quality education is the key civil rights issue of our time. This course will examine a host of education-related legal and policy issues that intersect with questions of race and class. Topics will include: desegregation and re-segregation, tracking, charter schools, school vouchers, high-stakes testing, the Common Core, school discipline, the "school to prison pipeline," and education in alternative schools, juvenile facilities, and adult prisons. This will be a discussion-oriented course that will operate more like a seminar than a lecture.
LAW 7037	Poverty Law: Policy and Practice	X		This survey course will cover historical and contemporary policy debates about poverty in the U.S. Topics will include the constitutional treatment of poverty, as well as the legal and policy treatment of questions of access to specific social goods, such as housing, health care, education, and legal services. We will also discuss "hot topics" in the field, such as criminalization of poverty, international perspectives on poverty, wage theft, and recent policy analyses at the 20th anniversary of welfare reform. Materials will include practice-derived materials as well as scholarly treatment of the issues. Students with a range of backgrounds and perspectives on the issues are encouraged to enroll. While a survey class, lecturing will be minimal, with student leadership of and participation in discussion will be principal methodology.

LAW 7040	Social Justice Impact Litigation: Issues and Strategies in Suits Against the Federal Government	X		This seminar explores strategic and legal issues related to using law reform and social justice litigation to advance the constitutional and civil rights of vulnerable communities, particularly with regard to litigation against the federal government. The focus this quarter will be examining the role of litigation in response to some current federal initiatives, particularly but not exclusively with regard to the rights of non-citizens. No previous experience or study of immigration law is expected; the seminar is open to all 2L and 3L students interested in the topic. The course will be informed by the instructor's thirty years of litigating class action and appellate cases, including in the Supreme Court, as the founder and former national director of the ACLU Immigrants' Rights Project and recent service in the Obama administration as senior counselor to the Secretary of Homeland Security. The seminar is designed to analyze doctrinal and strategic litigation responses to issues of broad public policy and social justice. Among the topics that may be included are selecting and using test cases; identifying plaintiffs; coalition litigation; strategic pleading; class action problems; the role of amicus briefs; suits for damages versus injunctive relief; standing and mootness; ethical problems; settlement strategies; use of public advocacy and media; the effect of lawsuits on policymakers and public officials; the role of government and agency lawyers; and litigation to achieve legislative change. Guest speakers will be invited.
LAW 7046	The Welfare State	X		Much has been written in recent years about the decline of the welfare state. Numerous adjectives have been applied to describe a trend toward austerity -- death, demise, withering, reversal. One writer suggested that the welfare state had not died, it had merely "moved to Asia" along with industrialization. This seminar introduces students to the key literature, questions, and debates about the modern welfare state. We will consider the emergence, growth, and current status of the welfare state, primarily in Western Europe and North America. The course will examine classical theories about markets and the emergence of social provision. We will also consider the leading theoretical and empirical research addressing the emergence of the welfare state, looking at the American case in comparative perspective. Attention will be paid to social and political factors on state development including political parties, labor markets, gender, demographic change, and immigration. We will then turn to the trend toward austerity and retrenchment, and the effect of globalization for the future of the welfare state.
LAW 7050	Toxic Harms	X		This seminar will examine the concerns arising from exposure to toxic substances from a variety of perspectives. A principal focus will be tort liability, and a central theme in the course will be whether tort law is an effective method of compensating victims of toxic exposure and controlling the distribution and/or emission of toxic substances. In order to assess the efficacy of tort, it is essential to compare the liability system with alternatives such as restructured "public law" litigation, administrative compensation schemes, and regulatory control strategies. Moreover, it seems equally important that these options be grounded in a concrete understanding of the major current problem areas. To accomplish these aims, the course will focus on a number of specific present concerns, including tobacco, asbestos, anti-inflammatory drugs, and workplace emissions exposures. In each instance, we will look at the nature of the public health problem as well as ensuing tort litigation and regulatory activity. In addition to examining these distinctive problem areas, we will look at broader, cross-cutting institutional reform proposals that have received recent attention. Students in Section (01) will write three ten-page writing exercises on topics discussed in class. After the term begins, students accepted into the course can transfer from section (01) into section (02), and have the option to write a final independent research paper for Research credit, with instructor consent.
LAW 7071	Philanthropy and Civil Society	X		Associated with the Center for Philanthropy and Civil Society (PACS). Year-long workshop for doctoral students and advanced undergraduates writing senior theses on the nature of civil society or philanthropy. Focus is on pursuit of progressive research and writing contributing to the current scholarly knowledge of the nonprofit sector and philanthropy. Accomplished in a large part through peer review. Readings include recent scholarship in aforementioned fields. May be repeated for credit for a maximum of 3 units. Cross-listed with Education ( EDUC 374), Political Science (POLISCI 334) and Sociology ( SOC 374)
LAW 7501	Carrots, Sticks, Norms, and Nudges: Changing Minds and Behaviors	X		In this class, we will survey the current state of the science of behavior change. By the 1990s, social scientists had already built a massive literature on this topic, and an integrative consensus theoretical framework began to emerge. But in the past decade, this literature has been revitalized by dramatic new ideas and technologies, as well as significant improvements in evaluation methodology. We will focus on four types of strategies that apply equally to influence efforts by individuals, communities, non-profits, for-profits, and government: (1) Carrots: Positive incentives (rewards, awards, praise, recognition, discounts, rebates, property rights, etc.); (2) Sticks: Negative incentives (punishments, fines, shaming, guilt or liability verdicts, costs, etc.); (3) Norms: What other people believe I should do, and what I see others actually do (tipping points, bandwagons, cascades, herding, etc.); and (4) Nudges: Traditional methods of persuasion; use of defaults to encourage certain behaviors; engineering the environment; harm reduction for risky behaviors. We will examine the "how" and "why" and "when" of these approaches, but also their normative implications for ethics, justice, and public welfare. Course requirements include class attendance and participation, and five short written assignments.

LAW 7818	Advanced Legal Writing: Technology Transactions	X		(Formerly Law 730) This course covers the foundations of drafting contracts in a modern commercial setting, primarily through weekly hands-on writing exercises that illustrate business problems and environmental regulation commonly found in today's technology transactions law practice. Topics to be addressed will include basic contract anatomy, common clause ambiguities, structuring for readable "flow", and drafting-for-negotiation techniques. Final examination will involve crafting a full-length technology license agreement from a rough term sheet that appears to have been pecked out on some sort of mobile device. No prior business law coursework, intellectual property background, or martial arts proficiency required. Elements used in grading: Class Participation, Attendance, Written Assignments, Final Exam
LAW 7823	Advanced Negotiation: International	X		(Formerly Law 661) Understanding the fundamentals of negotiation and conflict resolution in the international domain is now more critical than ever. This hands-on, advanced seminar is designed to teach students how to prepare for, participate in, and critically evaluate complex multiparty negotiations in the public international field. Through experience-based learning and simulations, the course will expose students to various types of international conflict resolution processes. These processes include second track negotiation and dialogue, natural resource management and extractive industries, and peace agreements, including security sector reform and DDR (disarmament, demobilization and reintegration of armed groups). Special attention will be paid to the role of mediators and facilitators in such processes, as well as lawyers and legal advocates.
LAW 7824	Advanced Negotiation: Public Policy (Divided Communities)	X		(Formerly Law 650) Advanced Negotiation courses are designed to take students beyond the two-party, lawyer-client negotiations that were the focus of the Negotiation Seminar, to examine many facets of negotiation complexity, both in terms of the participants and topics. This section of Advanced Negotiation will focus on multi-party negotiations, working in teams, group decision-making, and negotiating on behalf of organizations to solve complex problems, specifically when there are divided communities. We will study negotiations and stakeholder dialogue processes involving a diverse set of public and private actors. In the context of both real and simulated case studies, we will address diverse public policy issues, including civil rights, racial justice, economic inequality and natural resources management. Civil unrest as experienced recently in police-community conflicts -- such as Ferguson and Baltimore as well as in the Occupy Movement -- increase polarization among groups of residents in ways not seen in decades. The unrest sometimes produces positive results. In many instances, participants experience the divisions as intense and pervasive, yet remain optimistic that they can be resolved. These deep divisions pose significant challenges to the integrity of our democratic society and can quickly escalate to bitter contests, leaving fissures within communities for decades, and possibly resulting in major economic damage and even loss of life. The goals of the class are twofold, for students (1) to acquire an added theoretical base beyond what was covered in the Negotiation Seminar through which to analyze, prepare for, participate in and facilitate more complex, multiparty negotiations, and (2) to expand skills through deeper examination of various actual negotiation cases and complex simulations. Special Instructions: Attendance at and participation in the simulations is required. Passing is dependent upon active participation, submission of several assigned short reflection papers, and completion of a substantial group paper and presentation analyzing a selected case (a completed or ongoing multi-party public policy dialogue) and the team's internal negotiation process.
LAW 7825	Advanced Negotiation: Transactions	X		Advanced Negotiation takes students beyond the two-party, lawyer-client negotiations that were the focus of the Negotiation Seminar. Advanced Negotiation: Transactions places the student in more difficult and more nuanced simulations, working as individuals, pairs, and teams to negotiate on behalf of governments, unions and NGOs, as well as business entities. Simulations include critical-path supply agreements, vendor/collaborator contracts, cross-cultural joint ventures, airline reorganizations, big pharma arbitration resolution and big oil exploration negotiations. The goals of the class include acquiring a designer's mindset for strategic preparation and tactical adjustment to changing scenarios; deeper analysis of the argumentative and persuasive elements of any negotiation; coalition formation and management, and improved tactical skills such as reading non-verbal cues, methods of questioning, response control, situational agility and, ultimately, improved confidence and competence. Special Instructions: Attendance at and participation in all simulations and debriefing sessions is required. Passing is dependent upon this active participation, a series of short papers and in-class presentation.
LAWGEN 112N	Law and Inequality	X		Most Americans know that discrimination on the basis of race, sex, and religion is unlawful. Seems simple enough. But advertisements in the back of newspapers still announce: "Single White Female Seeks Single White Male?" Isn't that discrimination on the basis of race and sex? Most businesses don't consider men for women's locker room or bathroom attendant. And why aren't those men and women's bathrooms and locker rooms illegal segregation? After all we know what would happen if some business set up separate bathrooms for blacks and whites. Isn't it discrimination for an employer to insist that men wear a jacket and tie and women wear nylons and a skirt? Why are some forms of discrimination unlawful and others not? Why is discrimination against short people, overweight people, or people with annoying personalities not against the law? We will answer these and many other questions by looking at court cases, legal theory, and philosophy. We may also have conversations with guest lecturers who work in civil rights enforcement, and the seminar may include a field trip to visit the offices of civil rights lawyers (lawyers tend to be busy people so these opportunities will depend on their schedules).

LAWGEN 115N	Human Rights Advocacy	X		<p>What are the origins of the human rights movement and where is it headed? What does it mean to be a human rights activist? What are the main challenges and dilemmas facing those engaged in human rights advocacy? In the space of 60 years, human rights advocates have transformed a marginal utopian ideal into a central element of global discussion, if not practice. In this seminar we will examine the actors and organizations behind this remarkable development as well as the vast challenges faced by advocates in the recent past and today. Together, we will learn to be critical of, as well as to think, and act, like human rights advocates. This seminar will introduce you to some the main debates and dilemmas within the human rights movement. We will consider and understand the differing agendas of western international nongovernmental organizations (INGOs) and their counterparts in the frequently non-western developing world, as well as tensions between and among rights advocates along other important dimensions (civil and political vs. economic, social and cultural rights; rights promotion through engagement of powerful actors vs. challenging structures of power, etc.). The seminar seeks to develop your ability: 1) to understand human rights and social justice issues as contested political, legal and cultural phenomena; 2) to review advocacy texts, videos and other interventions critically; 3) to appreciate the political dimensions of efforts to promote human rights; 4) to understand how recent history constrains and structures options and possibilities for social intervention to promote rights and justice. During the course of the quarter you will be required to submit several short reflection papers and develop a <u>human rights advocacy campaign</u>.</p>
LINGUIST 156	Language and Gender (Same as FEMGEN 156X)	X		<p>The role of language in the construction of gender, the maintenance of the gender order, and social change. Field projects explore hypotheses about the interaction of language and gender. No knowledge of linguistics required.</p>
MATSCI 84N	Re-engineering the energy landscape		X	<p>Why hasn't electricity from solar panels, wind turbines, and other environmentally friendly resources taken over our energy landscape? Why is a hybrid car or an all-electric vehicle so expensive? In this seminar we will explore energy technologies and focus on how development in materials science enables a greener future. This seminar takes a hands-on approach; we will make solar cells and batteries and generate our own electricity. We will also include field trips to companies running large-scale energy production and green energy for transportation. Lastly we will explore advanced energy materials research at Stanford and find what still needs to be done in order to achieve a sustainable energy <u>landscape</u>.</p>
MATSCI 152	Electronic Materials Engineering	X		<p>Materials science and engineering for electronic device applications. Kinetic molecular theory and thermally activated processes; band structure; electrical conductivity of metals and semiconductors; intrinsic and extrinsic semiconductors; elementary p-n junction theory; operating principles of light emitting diodes, solar cells, thermoelectric coolers, and transistors. Semiconductor processing including crystal growth, ion implantation, thin film deposition, etching, <u>lithography, and nanomaterials synthesis</u>.</p>
MATSCI 154	Thermodynamic Evaluation of Green Energy Technologies	X		<p>Understand the thermodynamics and efficiency limits of modern green technologies such as carbon dioxide capture <u>from air, fuel cells, batteries, and solar-thermal power</u>.</p>
MATSCI 161	Energy Materials Laboratory (Same as MATSCI 171)		X	<p>Students use optical microscopy, x-ray diffraction, scanning electron microscopy, x-ray photoelectron spectroscopy, atomic force microscopy and other techniques to characterize recently discovered perovskite semiconductors that can be used to make highly efficient solar cells. This course fulfills the Writing in the Major Requirement for MSE undergrads. Instruction on writing, statistics, generating effective plots with curve fits, using databases to find information and giving oral scientific presentations is given. Instruction on characterization techniques is provided, but it is expected that the students will have already taken a course like MATSCI 153 that covers the fundamentals of the techniques. The emphasis on this course is on doing nanocharacterization experiments and writing up the results. Undergraduates register for 161 for 4 units; graduates register for 171 for 3 units.</p>
MATSCI 174	Electronic and Photonic Materials and Devices Laboratory (Same as MATSCI 164)	X		<p>Lab course. Current electronic and photonic materials and devices. Device physics and micro-fabrication techniques. Students design, fabricate, and perform physical characterization on the devices they have fabricated. Established techniques and materials such as photolithography, metal evaporation, and Si technology; and novel ones such as soft lithography and organic semiconductors, such as fuel cells and solar cells. Prerequisite: 152 or 199 or consent of instructor. Undergraduates register in 164 for 4 units; graduates register in 174 for 3 units.</p>
MATSCI 202	Materials Chemistry (Same as MATSCI 192)	X		<p>An introduction to the fundamental physical chemical principles underlying materials properties. Beginning from basic quantum chemistry, students will learn how the electronic configuration of molecules and solids impacts their structure, stability/reactivity, and spectra. Topics for the course include molecular symmetry, molecular orbital theory, solid-state chemistry, coordination compounds, and nanomaterials chemistry. Using both classroom lectures and journal discussions, students will gain an understanding of and be well-positioned to contribute to the frontiers of materials chemistry, ranging from solar-fuel generation to next-generation cancer treatments. Undergraduates register in 192 for 4 units; graduates register in 202 for 3 units.</p>
MATSCI 209	Electronic and Optical Properties of Solids (Same as MATSCI 199)	X		<p>The concepts of electronic energy bands and transports applied to metals, semiconductors, and insulators. The behavior of electronic and optical devices including p-n junctions, MOS-capacitors, MOSFETs, optical waveguides, quantum-well lasers, light amplifiers, and metallo-dielectric light guides. Emphasis is on relationships between structure and physical properties. Elementary quantum and statistical mechanics concepts are used. Prerequisite: 195/205 or equivalent. Undergraduates register for 199 for 4 units; graduates register for 209 for 3 units.</p>

MATSCI 302	Solar Cells	X		Theory of conventional pn junction and excitonic solar cells. Design, fabrication and characterization of crystalline silicon, CdTe, CIGS, tandem and organic solar cells. The device simulator PC1D is used to predict the performance of solar cells with various designs, recombination lifetime and surface recombination rates. The materials science aspects of solar cells research is emphasized, but module design and economic hurdles that must be overcome for solar cell technology to generate a significant fraction of the world's electricity are also addressed.
MATSCI 303	Principles, Materials and Devices of Batteries	X		Thermodynamics and electrochemistry for batteries. Emphasis on lithium ion batteries, but also different types including lead acid, nickel metal hydride, metal air, sodium sulfur and redox flow. Battery electrode materials, electrolytes, separators, additives and electrode-electrolyte interface. Electrochemical techniques; advanced battery materials with nanotechnology: battery device structure.
MATSCI 343	Organic Semiconductors for Electronics and Photonics	X		The science of organic semiconductors and their use in electronic and photonic devices. Topics: methods for fabricating thin films and devices; relationship between chemical structure and molecular packing on properties such as band gap, charge carrier mobility and luminescence efficiency; doping; field-effect transistors; light-emitting diodes; lasers; biosensors; photodetectors and photovoltaic cells.
ME 105	Designing for Impact	X		This course will introduce the design thinking process and skills, and explore unique challenges of solving problems and initiating action for public good. Design skills such as need-finding, insight development, and prototyping will be learned through project work, with a particular emphasis on the elements required to be effective in the social sector. Prerequisite: ME101.
ME 131B	Fluid Mechanics: Compressible Flow and Turbomachinery	X		Engineering applications involving compressible flow: aircraft and rocket propulsion, power generation; application of mass, momentum, energy and entropy balance to compressible flows; variable area isentropic flow, normal shock waves, adiabatic flow with friction, flow with heat addition. Operation of flow systems: the propulsion system. Turbomachinery: pumps, compressors, turbines. Angular momentum analysis of turbomachine performance, centrifugal and axial flow machines, effect of blade geometry, dimensionless performance of turbomachines; hydraulic turbines; steam turbines; wind turbines. Compressible flow turbomachinery: the aircraft engine.
ME 140	Advanced Thermal Systems	X		Capstone course. Thermal analysis and engineering emphasizing integrating heat transfer, fluid mechanics, and thermodynamics into a unified approach to treating complex systems. Mixtures, humidity, chemical and phase equilibrium, and availability. Labs apply principles through hands-on experience with a turbojet engine, PEM fuel cell, and hybrid solid/oxygen rocket motor. Use of MATLAB as a computational tool.
ME 141	Alternative Energy Systems		X	Capstone course. Energy analysis, diagnostics and engineering of selected alternative energy systems with an integrated thermodynamic, heat transfer, and fluid mechanic approach. Mixtures, transport, reactions, electrochemical processes and photovoltaic effects. Labs apply principles through hands-on experience with selected alternative energy systems and their components. Use of MATLAB as an analysis tool.
ME 204A	Bicycle Design and Frame-Building	X		Lecture/lab. The engineering and artistic execution of designing and building a bicycle frame. Fundamentals of bicycle dynamics, handling, and sizing. Manufacturing processes. Films, guest lecturers, field trips. Each student designs and fabricates a custom bicycle frame. This course is now a two part course series ME204A&B. Limited enrollment.
ME 204B	Bicycle Design and Frame-Building	X		The engineering and artistic execution of designing and building a bicycle frame. The fundamentals of bicycle dynamics, handling, and sizing. Manufacturing processes. Films, guest lecturers, field trips. Each student designs a custom bicycle frame that they continue from ME204A in winter quarter. Limited enrollment, admission by consent of instructors. Attendance at first lecture is required. Both ME204A and ME204B must be taken.
ME 206A	Entrepreneurial Design for Extreme Affordability (Same as OIT 333)		X	Project course jointly offered by School of Engineering and Graduate School of Business. Students apply engineering and business skills to design product prototypes, distribution systems, and business plans for entrepreneurial ventures in developing countries for a specified challenge faced by the world's poor. Topics include user empathy, appropriate technology design, rapid prototype engineering and testing, social technology entrepreneurship, business modeling, and project management. Weekly design reviews; final course presentation. Industry and adviser interaction. Limited enrollment via application; see extreme.stanford.edu
ME 206B	Entrepreneurial Design for Extreme Affordability (Same as OIT 334)		X	Part two of two-quarter project course jointly offered by School of Engineering and Graduate School of Business. Second quarter emphasizes prototyping and implementation of specific projects identified in first quarter. Students work in cross-disciplinary project teams. Industry and adviser interaction, weekly design reviews; final course presentation. Prerequisite: 206A. (Jointly offered as GSB OIT333B) Design Institute class; see <a href="http://dschool.stanford.edu">http://dschool.stanford.edu</a> .
ME 216A	Advanced Product Design: Needfinding	X		Human needs that lead to the conceptualization of future products, environments, systems, and services. Field work in public and private settings; appraisal of personal values; readings on social ethnographic issues; and needfinding for a corporate client. Emphasis is on developing the flexible thinking skills that enable the designer to navigate the future. Prerequisites for undergraduates: ME115A, ME115B and ME203, or consent of the instructor.

ME 216M	Introduction to the Design of Smart Products	X		This course will focus on the technical mechatronic skills as well as the human factors and interaction design considerations required for the design of smart products and devices. Students will learn techniques for rapid prototyping of smart devices, best practices for physical interaction design, fundamentals of affordances and signifiers, and interaction across networked devices. Students will be introduced to design guidelines for integrating electrical components such as PCBs into mechanical assemblies and consider the physical form of devices, not just as enclosures but also as a central component of the smart product.
ME 250	Internal Combustion Engines	X		Internal combustion engines including conventional and turbocharged spark ignition, and diesel engines. Lectures: basic engine cycles, engine components, methods of analysis of engine performance, pollutant emissions, and methods of engine testing. Lab involves hands-on experience with engines and test hardware.
ME 257	Turbine and Internal Combustion Engines (Same as ME 357)	X		Principles of design analysis for aircraft gas turbines and automotive piston engines. Analysis for aircraft engines performed for Airbus A380 type aircraft. Design parameters determined considering aircraft aerodynamics, gas turbine thermodynamics, compressible flow physics, and material limitations. Additional topics include characteristics of main engine components, off-design analysis, and component matching. Performance of automotive piston engines including novel engine concepts in terms of engine thermodynamics, intake and exhaust flows, and in-cylinder flow.
ME 271	Aerial Robot Design	X		An introduction to the aerodynamic design of rotor-based drones, for students with a background in robotics, aerospace, or fluids. Focus is on rotor-based drones operating at low Reynolds numbers, but material is applicable to drones, aviation and wind energy in general. Topics include: airfoil simulation, fundamentals of rotor aerodynamics, blade element analysis, rotor simulation and performance (e.g. mission duration, distance, maneuverability, and reliability). Midterm is the design of an airfoil for a drone, final is the aerodynamic design of a rotor for a drone; these projects will be peer-reviewed by students in the class. Prereqs: background in fluid mechanics or aerodynamics; fluency with MATLAB. Recommended: take ME202 or AA241X before or after ME271, for practical applications in drone prototyping and control theory.
ME 297	Forecasting for Innovators:Technology, Tools & Social Change	X		Technologies from the steam engine to the microprocessor have been mixed gifts, at once benefitting humankind and creating many of the problems facing humanity today. This class will explore how innovators can use forecasting methods to identify new challenges, develop responsive innovations and anticipate unintended consequences. Students will produce a long-range forecast project, applying a variety of methodologies including research, expert interviews and graphical exploration.
ME 302A	Introduction to Automotive and Transportation Innovation at Stanford	X		The objective of this course is to survey the innovative automotive and transportation community within Stanford. Stanford University has become one of the best universities on earth to change the future of transportation and this course is a 'who's who' of that world. This is the first part of a 3-quarter seminar series, which build on one another but can be taken independently. This quarter, the seminar will feature talks from Stanford experts in focus areas as varied as autonomous vehicles, entrepreneurship, design, ethics, aerodynamics, neuroscience, communications and security. At the end of the quarter, students will have developed an understanding of Stanford's portfolio of transportation work and know the specific individuals who are key to its future. To obtain credit, students must attend the first class (no exceptions) plus 7 additional classes for a total of 8 classes.
ME 302B	The Future of the Automobile- Driver Assistance and Automated Driving	X		The objective of this course is to develop an understanding for the requirements that go into the design of a highly complex yet easy-to-use product, i.e. the automobile. Students will learn about very different interdisciplinary aspects that characterize the automobile and personal mobility. This is the second part of a 3-quarter seminar series, which build on one another but can be taken independently. This quarter, the seminar will discuss how various vehicle systems help drivers to maneuver their vehicles through traffic. Advanced driver assistance systems range from navigation, adaptive cruise control, night vision, and lane departure warning to automated parking, traffic jam assistance, and eventually self-driving cars. These systems play an important role in making traffic safer, more efficient, and more enjoyable. This course, lectured by an industry expert, will introduce students to the technology behind the systems, the benefits, challenges, and future perspectives of this exciting field. Students will develop an understanding for the interactions of the technology, business, and society with a specific automotive focus.
ME 310A	Product-Based Engineering Design, Innovation, and Development	X		Three quarter sequence; for engineering graduate students intending to lead projects related to sustainability, automotive, biomedical devices, communication, and user interaction. Student teams collaborate with academic partners in Europe, Asia, and Latin America on product innovation challenges presented by global corporations to design requirements and construct functional prototypes for consumer testing and technical evaluation. Design loft format such as found in Silicon Valley consultancies. Typically requires international travel.
ME 310B	Product-Based Engineering Design, Innovation, and Development	X		Three quarter sequence; for engineering graduate students intending to lead projects related to sustainability, automotive, biomedical devices, communication, and user interaction. Student teams collaborate with academic partners in Europe, Asia, and Latin America on product innovation challenges presented by global corporations to design requirements and construct functional prototypes for consumer testing and technical evaluation. Design loft format such as found in Silicon Valley consultancies. Typically requires international travel.

ME 310C	Project-Based Engineering Design, Innovation, and Development	X		Three quarter sequence; for engineering graduate students intending to lead projects related to sustainability, automotive, biomedical devices, communication, and user interaction. Student teams collaborate with academic partners in Europe, Asia, and Latin America on product innovation challenges presented by global corporations to design requirements and construct functional prototypes for consumer testing and technical evaluation. Design loft format such as found in Silicon Valley consultancies. Typically requires international travel.
ME 368A	Alternative Spring Break: Rosebud Resilience: Community, Health and Learning in Lakota Nation	X		Open to MD, graduate, and undergraduate students. Classroom preparation followed by a one week spring break service learning experience on a reservation in South Dakota. Introduces students to the challenges and promise of Native American and rural health care, and the role of communities as leaders and problem solvers. Includes lectures, discussion and readings pertaining to Native American culture, current research in Native American health, and the <u>methods and practice of community based participatory research</u> .
ME 370A	Energy Systems I: Thermodynamics	X		Thermodynamic analysis of energy systems emphasizing systematic methodology for and application of basic principles to generate quantitative understanding. Exergy, mixtures, reacting systems, phase equilibrium, chemical exergy, and modern computational methods for analysis. Prerequisites: undergraduate engineering thermodynamics and computer <u>skills such as Matlab</u> .
ME 370B	Energy Systems II: Modeling and Advanced Concepts	X		Development of quantitative device models for complex energy systems, including fuel cells, reformers, combustion engines, and electrolyzers, using thermodynamic and transport analysis. Student groups work on energy systems to develop conceptual understanding, and high-level, quantitative and refined models. Advanced topics in <u>thermodynamics and special topics associated with devices under study</u> .
ME 370C	Energy Systems III: Projects	X		Refinement and calibration of energy system models generated in ME 370B carrying the models to maturity and completion. Integration of device models into a larger model of energy systems. Prerequisites: 370A,B, consent of <u>instructor</u> .
ME 371	Combustion Fundamentals	X		Heat of reaction, adiabatic flame temperature, and chemical composition of products of combustion; kinetics of combustion and pollutant formation reactions; conservation equations for multi-component reacting flows; <u>propagation of laminar premixed flames and detonations</u> .
ME 372	Combustion Applications	X		The role of chemical and physical processes in combustion; ignition, flammability, and quenching of combustible gas mixtures; premixed turbulent flames; laminar and turbulent diffusion flames; combustion of fuel droplets and sprays.
ME 410A	Introductory Foresight and Technological Innovation	X		Learn to develop long-range, technology-based innovations (5+ years based on industry). This course offers an intensive, hands-on approach using multiple engineering foresight strategies and tools. Model disruptive opportunities <u>and create far-to-near development plans. Three quarter sequence</u> .
ME 410B	Advanced Foresight and Technological Innovation	X		Continuation of ME410A. Students will continue developing their invention, integrate additional engineering foresight, and develop an intrinsic innovation mindset. Ongoing discussion of industry examples and contemporary events <u>demonstrate foresight principals and engineering leadership in action</u> .
ME 410C	Advanced Foresight and Technological Innovation	X		Continuation of ME410B. Students will continue developing their invention, integrate additional engineering foresight, and develop an intrinsic innovation mindset. Ongoing discussion of industry examples and contemporary events <u>demonstrate foresight principals and engineering leadership in action</u> .
MED 108Q	Human Rights and Health	X		Preference to sophomores. History of human-rights law. International conventions and treaties on human rights as background for social and political changes that could improve the health of groups and individuals. Topics such as: regional conflict and health, the health status of refugees and internally displaced persons; child labor; trafficking in women and children; HIV/AIDS; torture; poverty, the environment and health; access to clean water; domestic violence and sexual assault; and international availability of drugs. Possible optional opportunities to observe at community sites where human rights and health are issues. Guest speakers from national and international NGOs including Doctors Without Borders; McMaster University Institute for Peace Studies; UC Berkeley Human Rights Center; Kiva. PowerPoint presentation on topic of choice required.
MED 157	Foundations for Community Health Engagement	X		Open to undergraduate, graduate, and MD students. Examination and exploration of community health principles and their application at the local level. Designed to prepare students to make substantive contributions in a variety of community health settings (e.g. clinics, government agencies, non-profit organization, advocacy groups). Topics include community health assessment; health disparities; health promotion and disease prevention; strategies for working with diverse, low-income, and underserved populations; and principles of ethical and effective community engagement.
MED 159	Oaxacan Health on Both Sides of the Border	X		Required for students participating in the Community Health in Oaxaca summer program. Introduction to the health literacy and health-seeking behaviors of Oaxacan and other Mexican migrants; the health challenges these groups face. Through discussion and reflection, students prepare for clinical work and community engagement in Oaxaca, while also gaining knowledge and insight to make connections between their experiences in Mexico and their health-related work with Mexican immigrants in the Bay Area. Service Learning Course (certified by Haas Center). Prerequisite: application and acceptance into the Community Health in Oaxaca Summer Program ( <a href="http://och.stanford.edu/oaxaca.html">http://och.stanford.edu/oaxaca.html</a> ).

MED 161A	Community Health Advocacy	X		<p>First of a three-quarter course series providing students with knowledge and concrete skills for working with and advocating for underserved populations. Through coursework and placements in community health clinics and social service organizations, students broaden and deepen their understanding of the social and economic determinants of health, how they impact underserved populations, and the various levels at which these challenges can be addressed. Fellows engage in structured activities centered around supporting the mission of placement organizations.</p>
MED 161B	Community Health Advocacy	X		<p>Second of a three-quarter course series that provides students with knowledge and concrete skills for working with and advocating for underserved populations. Through coursework and placements in community health clinics and social service organizations, student will broaden and deepen their understanding of the social and economic determinants of health, how they impact underserved populations, and the various levels at which these challenges can be addressed. Student will engage in structured activities that center around supporting the mission of their placement organization: direct service with clients and design and implementation of a capacity-building project. Weekly Monday evening classroom meetings serve as a forum for teaching and training, discussion of class readings and placement experiences, project development, and troubleshooting and support.</p>
MED 161C	Community Health Advocacy	X		<p>Third of a three-quarter course series that provides students with knowledge and concrete skills for working with and advocating for underserved populations. Through coursework and placements in community health clinics and social service organizations, students broaden and deepen their understanding of the social and economic determinants of health, how they impact underserved populations, and the various levels at which these challenges can be addressed. Student engage in structured activities that center around supporting the mission of their placement organization: direct service with clients and design and implementation of a capacity-building project. Weekly evening classroom meetings serve as a forum for teaching and training, discussion of class readings and placement experiences, project development, and troubleshooting and support.</p>
MED 226	Practical Approaches to Global Health Research (Same as IPS 290, HRP 237)	X		<p>How do you come up with an idea for health research overseas? How do you develop a research question, concept note, and get your project funded? How do you manage personnel in the field, difficult cultural situations, or unexpected problems? How do you create a sampling strategy, select a study design, and ensure ethical conduct with human subjects? This course takes students through the process of health research in under-resourced countries from the development of the initial research question and literature review to securing support and detailed planning for field work. Students progressively develop and receive weekly feedback on a concept note to support a funding proposal addressing a research question of their choosing.</p>
MED 228	Physicians and Social Responsibility	X		<p>Social and political context of the roles of physicians and health professionals in social change; policy, advocacy, and shaping public attitudes. How physicians have influenced governmental policy on nuclear arms proliferation; environmental health concerns; physicians in government; activism through research; the effects of poverty on health; homelessness; and gun violence. Guest speakers from national and international NGOs.</p>
MED 232	Discussions in Global Health	X		<p>The goal of this interactive series is to encourage students to think broadly about the variety of activities encompassed within global health and the roles of various entities, including NGOs, governments, and healthcare providers, in responding to large-scale health crises, building health systems, and caring for patients in developing countries. Examines challenges in global health such as organizing medical responses to natural disasters, providing healthcare to societies in conflict, and integrating traditional and modern approaches to healing. Case studies are used to critique strategies employed by organizations that work to improve medical care in poor settings.</p>
MED 233	Global Health: Beyond Diseases and International Organizations	X		<p>Provides multidisciplinary trainees insight into over-arching themes of global health. Topics include systemic issues affecting healthcare progress globally, ethical and thoughtful approaches to solving these issues, as well as economics, water sanitation, public health, organizations in global health, human rights, involvement in NGOs, ethics of overseas work, and other non-medical aspects of this subject. This course will cover some of the essentials of patient care while working in the field as well including child health care, malaria, TB, and HIV.</p>
MED 242	Physicians and Human Rights	X		<p>Weekly lectures on how human rights violations affect health. Topics include: regional conflict and health, the health status of refugees and internally displaced persons; child labor; trafficking in women and children; HIV/AIDS; torture; poverty, the environment and health; access to clean water; domestic violence and sexual assault; and international availability of drugs. Guest speakers from national and international NGOs including Doctors Without Borders; McMaster University Institute for Peace Studies; UC Berkeley Human Rights Center; Kiva.</p>

MED 256SI	Race, Class and Global Health (Same as CSRE 256SI)	X		This course's goal is to critically engage students in the socioeconomic and racial disparities in healthcare outcomes and encourage students to think broadly about the complex relationship between institutions, healthcare providers, socioeconomic status, and race/ethnicity. The topics will center on conceptual issues important for understanding how socioeconomic and minority status can lead to poor health outcomes examining how conscious and unconscious institutional biases affect treatment, care, and access, and addressing proposals for how to reduce disparities in health care. The focus of the course is broad. The first three weeks will center on public health issues due to global healthcare trends, including the results of disparities in the United States. These discussions will frame our sessions in the latter six weeks, which will each consist of a case study of specific cases of disparities and response to such inequities worldwide, from India to Rwanda. Each class's discussion will be guided by case studies. The readings will come from a variety of sources, including academic journals, more popular journals and magazines, books and government documents.
MED 273	Biodesign for Mobile Health (Same as BIOE 273)	X		Examines the emerging Mobile Health industry. Mobile health (mHealth, or, wireless health) is the provision of health services and information via mobile technologies such as mobile phones and wearable sensors. Innovations in this area promise solutions to the need for universal access to affordable and effective health care by enabling consumers to take charge of their health, creating affordable ways to manage aging and chronic conditions, moving care from the hospital into the home, improving treatment options by providing transparency of measurable clinical outcomes, and shifting the focus from sick care to health improvement and prevention. Topics include the driving needs, applications, challenges and incentives that characterize the emerging mobile health landscape, and include an overview of some of the devices and companies that are already transforming the way health care is accessed today. Faculty and guest speakers discuss the status of the industry and research in Mobile Health, as well as opportunities in and challenges to medical technology innovation unique to this area. Issues related to Key Markets/Applications, Consumer/Enterprise Innovation, Policy/Regulatory, Financing, Business Models, Global Initiatives and Entrepreneurship are covered.
MGTECON 300	Growth and Stabilization in the Global Economy	X		This course gives students the background they need to understand the broad movements in the global economy. Key topics include long-run economic growth, technological change, wage inequality, international trade, interest rates, inflation, exchange rates, and monetary policy. By the end of the course, students should be able to read and understand the discussions of economic issues in The Economist, the Wall Street Journal, the New York Times, or the Congressional Budget Office.
MGTECON 327	Business and Public Policy Perspectives on U.S. Inequality	X		This class will analyze the growth in inequality in the US over the last several decades and how that trend is likely to continue or change in the future. We will ask if and how public policy can affect inequality. We will also focus on business's role -- what are the responsibilities of private sector companies, how does inequality affect them, and how should the growth in inequality affect their strategies? We will look at inequality in income, some of its potential sources, and its effects in other areas. Specifically, we will look at education, housing, the social safety net, migration, and the job market. The class will be very interactive and will be based on readings drawn from academic research, case studies, news, and opinion readings. We will also have guest speakers from industry, government, and non-profits. The class will be co-taught by a GSB labor economist and an advisor to policy makers with decades of business experience.
MGTECON 331	Health Law: Finance and Insurance	X		This course provides the legal, institutional, and economic background necessary to understand the financing and production of health services in the US. Potential topics include: health reform, health insurance (Medicare and Medicaid, employer-sponsored insurance, the uninsured), medical malpractice and quality regulation, pharmaceuticals, the corporate practice of medicine, regulation of fraud and abuse, and international comparisons.
MGTECON 383	Measuring Impact in Practice	X		This class will provide students practical skills for measuring impact in business and social enterprise, with a principal focus on evaluating, conducting, and analyzing experiments and quasi-experiments. How large is the impact of raising prices on sales? Is an advertising campaign working? Does a non-profit actually improve people's lives? Students will finish the course with the ability to design, analyze, and skeptically evaluate experiments that can rigorously answer questions like these. Students will learn: how to evaluate claims of causality; how to conduct and analyze experiments and quasi-experiments; the advantages and disadvantages of experiments; how to quantify uncertainty; and what can go wrong in experiments. Students will acquire a conceptual understanding of basic experimental statistics to inform these skills. Students will also be exposed to how leading companies, researchers, and social innovators strategically deploy experiments. Finally, students will conduct their own experiments on a topic of their choosing in small groups. The class will not assume any prior statistical or mathematical training. Completing short problem sets will require acquiring basic knowledge of R.

MI 70Q	Photographing Nature	X		Utilizes the idiom of photography to learn about nature, enhance observation, and explore scientific concepts. Builds upon the pioneering photographic work of Eadweard J. Muybridge on human and animal locomotion. A secondary goal is to learn the grammar, syntax, composition, and style of nature photography to enhance the use of this medium as a form of scientific communication and also to explore the themes of change across time and space. Scientific themes to be explored include: taxonomy, habitat preservation, climate change; species diversity; survival and reproductive strategies; ecological niches and coevolution, carrying capacity and sustainability, population densities, predation, and predator-prey relationships, open-space management, the physics of photography. Extensive use of field trips and class critique.
MI 155A	Humans and Viruses I (Same as HUMBIO 155H)	X		Introduction to human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis is on host pathogen interactions and policy issues. Topics: polio and vaccination, smallpox and eradication, yellow fever and history, influenza and genomic diversity, rubella and childhood infections, adenovirus and viral morphology, ebola and emerging infection, lassa fever and immune response.
MI 155B	Humans and Viruses II (Same as HUMBIO 155V)	X		Introduction to human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis on host pathogen interactions and policy issues. Topics: measles and viral epidemiology, rotavirus and world health, rabies and infections of the brain, HPV and cancer-causing viruses, herpes simplex and viral latency, CMV and viral teratogenesis, retrovirology and endogenous viral sequences, HIV and viral treatment, viral hepatitis and chronic infections, prions and diseases of life style.
MI 155C	Human and Viruses Part III (Same as HUMBIO 155C)	X		Comprehensive survey of human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis on host pathogen interactions and policy issues.
MI 155D	Human and Viruses Part IV (Same as HUMBIO 155D)	X		Comprehensive survey of human virology integrating epidemiology, molecular biology, clinical sciences, social sciences, history, and the arts. Emphasis on host pathogen interactions and policy issues.
MKTG 337	Applied Behavioral Economics	X		The field of behavioral economics couples scientific research on the psychology of decision making with economic theory to better understand what motivates economic agents, including consumers, managers, public policymakers, investors, and employees. In this course, we will examine topics such as the "irrational" patterns of how people think about products, money and investments, designing strategies and offerings to change behavior, and the drivers of happiness and the role of emotions in decision-making. This highly interdisciplinary course will be particularly relevant to students with interests in general management, entrepreneurship, Marketing, Strategy, Behavioral Finance, public policy, and nonprofit. Topics covered will include: Rationality and choice, choice complexity, intertemporal choice, emotional influences on choice, the role of behavioral economics in marketing, spending and savings behavior, social welfare, choice architecture, and defaults. The goals of this course are threefold: a) to study the basic principles of behavioral economics, b) To learn the application of the principles to various aspects of business and policy, and c) to think about a framework for developing products, programs, and tactics that are behaviorally informed. The course is composed of a mixture of lectures, exercises, academic paper reviews, and in-class case discussions. The purpose of the lectures is to present and discuss theories, concepts, analytical techniques and empirical findings. In-class exercise will be used to apply the concepts and techniques covered in the class. We will discuss a few business cases. In addition, students working in teams will prepare an analysis and recommended behavioral strategy for a company/startup of their choice.
MS&E 92Q	International Environmental Policy		X	Preference to sophomores. Science, economics, and politics of international environmental policy. Current negotiations on global climate change, including actors and potential solutions. Sources include briefing materials used in international negotiations and the U.S. Congress.
MS&E 93Q	Nuclear Weapons, Energy, Proliferation, and Terrorism	X		Preference to sophomores. At least 20 countries have built or considered building nuclear weapons. However, the paths these countries took in realizing their nuclear ambitions vary immensely. Why is this the case? How do the histories, cultures, national identities, and leadership of these countries affect the trajectory and success of their nuclear programs? This seminar will address these and other questions about nuclear weapons and their proliferation. Students will learn the fundamentals of nuclear technology, including nuclear weapons and nuclear energy, and be expected to use this knowledge in individual research projects on the nuclear weapons programs of individual countries. Case studies will include France, UK, China, India, Israel, Pakistan, North Korea, South Africa, Libya, Iraq, and Iran, among others. Please note any language skills in your application.
MS&E 135	Networks	X		This course provides an introduction to how networks underly our social, technological, and natural worlds, with an emphasis on developing intuitions for broadly applicable concepts in network analysis. The course will include: an introduction to graph theory and graph concepts; social networks; information networks; the aggregate behavior of markets and crowds; network dynamics; information diffusion; the implications of popular concepts such as "six degrees of separation", the "friendship paradox", and the "wisdom of crowds".
MS&E 243	Energy and Environmental Policy Analysis		X	Concepts, methods, and applications. Energy/environmental policy issues such as automobile fuel economy regulation, global climate change, research and development policy, and environmental benefit assessment. Group project.
MS&E 262	Supply Chain Management	X		Definition of a supply chain; coordination difficulties; pitfalls and opportunities in supply chain management; inventory/service tradeoffs; performance measurement and incentives. Global supply chain management; mass customization; supplier management. Design and redesign of products and processes for supply chain management; tools for analysis; industrial applications; current industry initiatives.

MS&E 262	Biodesign Innovation: Concept Development and Implementation (Same as BIOE 374B, MED 272B)	X		In this two-quarter course series ( OIT 384/5), multidisciplinary student teams identify real-world unmet healthcare needs, invent new medtech products to address them, and plan for their development into patient care. During the first quarter (winter 2017), students select and characterize an important unmet healthcare problem, validate it through primary interviews and secondary research, and then brainstorm and screen initial technology-based solutions. In the second quarter (spring 2017), teams select a lead solution and move it toward the market through prototyping, technical re-risking, strategies to address healthcare-specific requirements (regulation, reimbursement), and business planning. Final presentations in winter and spring are made to a panel of prominent medtech experts and investors. Class sessions include faculty-led instruction and case demonstrations, coaching sessions by industry specialists, expert guest lecturers, and interactive team meetings.
MS&E 295	Energy Policy Analysis		X	Design and application of formal analytical methods for policy and technology assessments of energy efficiency and renewable energy options. Emphasis is on integrated use of modeling tools from diverse methodologies and requirements for policy and corporate strategy development.
MS&E 298	Hacking for Diplomacy: Tackling Foreign Policy Challenges with the Lean Launchpad (Same as IPS 232)	X		At a time of significant global uncertainty, diplomats are grappling with transnational and cross-cutting challenges that defy easy solution including: the continued pursuit of weapons of mass destruction by states and non-state groups, the outbreak of internal conflict across the Middle East and in parts of Africa, the most significant flow of refugees since World War II, and a changing climate that is beginning to have impacts on both developed and developing countries. While the traditional tools of statecraft remain relevant, policymakers are looking to harness the power of new technologies to rethink how the U.S. government approaches and responds to these and other long-standing challenges. In this class, student teams will take actual foreign policy challenges and learn how to apply lean startup principles, ("mission model canvas," "customer development," and "agile engineering") to discover and validate agency and user needs and to continually build iterative prototypes to test whether they understood the problem and solution. Teams take a hands-on approach requiring close engagement with officials in the U.S. State Department and other civilian agencies.
MS&E 391	Doctoral Research Seminar in Energy-Environmental Systems Modeling and Analysis	X		Restricted to PhD students, or by consent of instructor. Doctoral research seminar covering current topics in energy and environmental modeling and analysis. Current emphasis on approaches to incorporation of uncertainty and technology dynamics into complex systems models. May be repeated for credit.
MS&E 494	The Energy Seminar (Same as ENERGY 301, CEE 301)		X	Interdisciplinary exploration of current energy challenges and opportunities, with talks by faculty, visitors, and students.
NATIVEAM 16	Native Americans in the 21st Century: Encounters, Identity, and Sovereignty in Contemporary America (Same as ANTHRO 16, ANTHRO 116C, ARCHLGY 16)	X		What does it mean to be a Native American in the 21st century? Beyond traditional portrayals of military conquests, cultural collapse, and assimilation, the relationships between Native Americans and American society. Focus is on three themes leading to in-class moot court trials: colonial encounters and colonizing discourses; frontiers and boundaries; and sovereignty of self and nation. Topics include gender in native communities, American Indian law, readings by native authors, and Indians in film and popular culture.
NATIVEAM 211	The California Missions: Art History and Reconciliation (Same as ARTHIST 211, CSRE 111)	X		Sites of the spirit and devotion, sites of genocide, foreboding actors in Alfred Hitchcock's Vertigo, the subject of fourth-grade school projects, the Spanish Missions of Alta California are complex sites of inquiry, their meanings and associations different for each visitor. This seminar examines the art and architecture of the California Missions built between 1769 and 1823. Constructed with local materials and decorated with reredos, paintings and sculptures from Mexico and Spain, the Missions are at once humble spaces and flagships of a belated global baroque. They were also the laboratories of indigenous artists and artisans. This course seeks to understand how Mission art was meant to function, how and why it was made, what its materials were, while asking what the larger role of art was in a global system of missions. Can the study of this art lead to the reconciliation of populations in North America and within the field of art history? The Missions require a specific reexamination of the relationship between European and colonial forms, not as objects of curiosity or diffusion but as viable and globally informed agents.
NATIVEAM 240	Psychology and American Indian Mental Health (Same as EDUC 340)	X		Western medicine's definition of health as the absence of sickness, disease, or pathology; Native American cultures' definition of health as the beauty of physical, spiritual, emotional, and social things, and sickness as something out of balance. Topics include: historical trauma; spirituality and healing; cultural identity; values and acculturation; and individual, school, and community-based interventions. Prerequisite: experience working with American Indian communities.

OB 512	Creating, Building, and Sustaining Breakthrough Ventures	X		This course is designed to provide students with a summary of entrepreneurial processes that have successfully created, developed, and sustained breakthrough ventures. By "breakthrough" we mean ventures that have had a lasting and positive impact, touching millions of lives. We consider ventures that are not only software related, but also ones based on technology and business models that impact markets ranging from medical devices to small satellites to home robotics systems to clean water and more. The examples are based on the experiences of Norman Winarsky, formerly President of SRI Ventures, and Henry Kressel, Partner Emeritus at Warburg Pincus. They include companies like Siri, Nuance, Intuitive Surgical, Sandisk, and others. The course leads us from the source of breakthrough venture ideas, to building a great value proposition and business plan, recruiting a team, finding investors and board members, deciding whether to sell or go IPO, and ends with what it takes to build a company that can sustain itself through continuous innovation. At each step, we follow examples of companies we've helped build, and provide lessons of success as well as failure. We compare and contrast the strategies of these ventures with other popular strategies, such as those proposing "Fail fast, develop minimal viable products, and pivot often..." The course will be highly interactive, and engage students in discussing their own experiences and future plans. Invited speakers will include venture capitalists and entrepreneurs who have created breakthrough companies.
OIT 273	Value Chain Innovations in Developing Economies	X		This course is about how to use entrepreneurship and innovations in the value chains to create values in developing economies. The course will cover important principles and ways in which the value chains can be re-engineered or new business models can be designed to create values. In addition to materials covering a diversity of industries and geographical regions, the course will also enable students to be exposed to some of the interventions that the Stanford Institute of Innovation in Developing Economies (SEED) is working on in West Africa. Work and exam requirements: Students are expected to develop a project report on either portfolio companies related to SEED or other enterprises to show how value chain innovations can be advanced.
OIT 333	Design for Extreme Affordability (Same as ME 206A)	X		This course is a Bass Seminar. Project course jointly offered by School of Engineering and Graduate School of Business. Students apply engineering and business skills to design product or service prototypes, distribution systems, and business plans for entrepreneurial ventures that meet that challenges faced by the world's poor. Topics include user empathy, appropriate technology design, rapid prototype engineering and testing, social technology entrepreneurship, business modeling, and project management. Weekly design reviews; final course presentation. Industry and adviser interaction. Limited enrollment via application; see <a href="http://extreme.stanford.edu/index.html">http://extreme.stanford.edu/index.html</a> for details.
OIT 334	Design for Extreme Affordability (Same as ME 206B)	X		This course is a Bass Seminar. Project course jointly offered by School of Engineering and Graduate School of Business. Students apply engineering and business skills to design product or service prototypes, distribution systems, and business plans for entrepreneurial ventures that meet that challenges faced by the world's poor. Topics include user empathy, appropriate technology design, rapid prototype engineering and testing, social technology entrepreneurship, business modeling, and project management. Weekly design reviews; final course presentation. Industry and adviser interaction. Limited enrollment via application; see <a href="http://extreme.stanford.edu/index.html">http://extreme.stanford.edu/index.html</a> for details.
OIT 655	Foundations of Supply Chain Management	X		This course provides an overview of research in supply chain management (SCM). It has three parts. The first part reviews basic tools of SCM research through selected readings in economics, IT and operations research. The second part reviews the literature in SCM, covering topics such as inventory models, information sharing, information distortion, contract design, value of integration, performance measurement, risk management, and the use of markets for procurement. The last part is devoted to recent advances in SCM research.
OSPAUSTL 10	African American Women's Lives (Same as AFRICAAM 54N, AMSTUD 54N, FEMGEN 54N, CSRE 54N)	X		Preference to freshmen. We will examine the struggles of African American women to define their own lives and improve the social, economic, political and cultural conditions of black communities. Topics will include women's enslavement and freedom, kinship and family relations, institution and community building, violence, labor and leisure, changing gender roles, consumer and beauty culture, social activism, and the politics of sexuality.
OSPAUSTL 25	Alternative Spring Break: Healthcare of Underserved Communities in Central California	X		Pre-field group directed reading for Alternative Spring Break: Healthcare of Underserved Communities in Central California.
OSPAUSTL 30	SENSA Lab Social Enterprise Seminar (Same as CEE 146E)	X		Students attend a weekly seminar and meet with mentors to discuss and get feedback on SENSA labs social enterprise projects. Attendance at all seminars is required for credit.
OSPAUSTL 40	Physics of Cities	X		An introduction to the modern study of complex systems with cities as an organizing focus. Topics will include: cities as interacting systems; cities as networks; flows of resources and information through cities; principles of organization, self-organization, and complexity; how the properties of cities scale with size; and human movement patterns. No particular scientific background is required, but comfort with basic mathematics will be assumed. Prerequisites: MATH 19 and 20, or the equivalent.
OSPBEIJ 23	China's Foreign Policy	X		Chinese foreign relations through examination of interactions between China and the rest of the world in a selected number of "non-traditional security" issue areas; challenges that affect the whole world. Key debates in the Chinese security studies field, with particular attention to considerations of those issues that warrant concern and contribution through means other than application of military power; trajectory of contemporary Chinese interactions with international and multi-national actors in addressing those challenges; complexity and factors in considerations of future paths of interactions with Chinese actors in managing the transnational issues covered in the course and beyond.

OSPBEIJ 23	China and Global Challenges	X		Chinese foreign relations through examination of interactions between China and the rest of the world in a selected number of "non-traditional security" issue areas; challenges that affect the whole world. Key debates in the Chinese security studies field, with particular attention to considerations of those issues that warrant concern and contribution through means other than application of military power; trajectory of contemporary Chinese interactions with international and multi-national actors in addressing those challenges; complexity and factors in considerations of future paths of interactions with Chinese actors in managing the transnational issues covered in the course and beyond.
OSPBEIJ 24	China's Economic Development	X		Historical stages, economic and political rationale, and effectiveness of the economic policies and institutional changes that have shaped China's economic emergence. China as case study for understanding how institutions and institutional change affect economic and social development. Guest speakers; field study; trip to rural areas.
OSPBEIJ 35	Toward a Sustainable Future: China's Environmental Challenges		X	Pertinent environmental challenges facing China's economy and society; economic tools and models to study China's environmental dilemmas; China's environmental challenges in the global discussion on climate change and other global environmental problems; the current global regulatory structures and the politics of future international and domestic regulatory reform.
OSPBEIJ 82	Globalization and the Chinese City	X		Dynamics of China's urban transformation and contemporary city life in the context of globalization. Applying interdisciplinary and comparative perspectives to selected themes related to the distinctive characteristics of China's urban development, students gain critical knowledge and understanding of how Chinese urban space is transformed by the forces of globalization, urbanization, marketization, and political decentralization; socio-spatial implications upon urban residents and the migrant population. Opportunities and challenges that Chinese cities face, given its current urban development strategies and trajectories. Field trips and site visits.
OSPBER 71	EU in Crisis	X		Challenges confronting Europe as a whole and the EU in particular: impact of the sovereign debt crisis of the Eurozone, mass migration, external and internal security challenges, as well as political and social needs for reform. How the EU and its members respond and if the opportunities of these crises are constructively used for reform - or wasted (Crisis = Danger + Opportunity). Analyse institutions, interests and competing narratives to explain the current situation in Europe. Excursion to Athens or similar to get a non-German perspective on the crises.
OSPCPTWN 30	Engaging Cape Town	X		Engaged scholarship course inviting students to think critically about core concepts in engaged scholarship. Focus on issues of identity and diversity. Students are called upon to evaluate (and modulate) their time in Cape Town in relation to these concepts. Drawing on their own experiences, identity politics, prescribed reading material, applied reading material and their engagement with informal learning spaces in Cape Town, students will interrogate how their identities and those of fellow South Africans are produced and reproduced.
OSPCPTWN 38	Genocide: African Experiences in Comparative Perspective	X		Genocide as a major social and historical phenomenon, contextualized within African history. Time frame ranging from the extermination of indigenous Canary Islanders in the fourteenth and fifteenth centuries to more recent mass killings in Rwanda and Darfur. Emphasis on southern African case studies such Cape San communities and the Herero people in Namibia. Themes include: roles of racism, colonialism and nationalism in the making of African genocides. Relevance of other social phenomena such as modernity, Social Darwinism, ethnicity, warfare and revolution. Comparative perspective to elucidate global dimensions.
OSPCPTWN 43	Public and Community Health in Sub-Saharan Africa	X		Introduction to concept of public health as compared with clinical medicine. Within a public health context, the broad distribution of health problems in sub-Saharan Africa as compared with U.S. and Europe. In light of South Africa's status as a new democracy, changes that have occurred in health legislation, policy, and service arenas in past 16 years. Topics include: sector health care delivery, current distribution of infectious and chronic diseases, and issues related to sexual and reproductive health in South Africa. Site visits to public sector health services and health related NGOs.
OSPCPTWN 43	Beyond Pink and Blue: Gender in Tech (Same as FEMGEN 344F, HISTORY 244F)	X		This d-school seminar prototypes concepts and methods for "inclusive" design. From the moment we arrive on the planet, gender shapes our perception of the world. Examples of products (including objects, services, and systems) gone awry will serve as prompts for design activities, challenges, and discussions on gender issues to illustrate the different needs of women, men, and gender-fluid people. Class sessions mix use case explorations with design methodology, design thinking abilities, and guest speakers from technology, design, and academia. Students will be asked to work in interdisciplinary teams on several design challenges, culminating in the development of a toolkit for inclusive design. Methods will interact in crucial ways to create "intersectional thinking" (i.e., to consider how gender, ethnicity, sexuality, socio-economic status, etc. work together to require new solutions in design). Topics include: algorithms, media, seat belts for pregnant women, robotics, assistive technologies, tech for developing worlds, video games, urban/rural design, software development, and many more.
OSPCPTWN 70	Youth Citizenship and Community Engagement	X		Critical thinking about core concepts in community engagement such as community, self, and identity. The course aims to cultivate a critical consciousness about the meaning of charity, caring, social justice and the aims of engagement with communities to enhance self awareness, awareness of others who are different, awareness of social issues, and an ethic of care where students can be change agents. The meaning of youth citizenship as it relates to engagement with communities will be explored.

OSPCPTWN 76	(South) Africa Rising: Implications for Conflict, Democracy, and Human Rights	X		International political impacts of (South) Africa's emergence, including how the country's extraordinary wealth and stability (despite its ongoing challenges) translates into a unique role in shaping the trajectory of the continent. Key question: whether Africa will remain a place where autocratic rulers are insulated from external pressure and left alone to commit abuses in their own countries, or whether they will face pressure from their neighbors and the region acting collectively to change their ways. South African perspectives from Cape Town scholars and activists. Field trips to meet <u>directly with South African government officials</u> .
OSPFLO 8	Migration and Cultural Diversity in Contemporary Italy	X		Exploration of the media as an arena where Italian national and individual identities (of both migrants and natives) are being redefined in an age of globalization, massive migration flows and increasing social diversity. Over the last thirty years, Italy has been transformed from a country of exclusive emigration into a country where recent immigration is becoming one of the most controversial issues faced by Italian society and the political system today.
OSPFLO 58	Space as History: Social Vision and Urban Change	X		A thousand years of intentional change in Florence. Phases include programmatic enlargement of ecclesiastical structures begun in the 11th century; aggressive expansion of religious and civic space in the 13th and 14th centuries; aggrandizement of private and public buildings in the 15th century; transformation of Florence into a princely capital from the 16th through the 18th centuries; traumatic remaking of the city's historic core in the 19th century; and development of new residential areas on the outskirts and in neighboring towns in the 20th and 21st centuries.
OSPFLO 85	An Introduction to Political Economy of Development	X		This course is an upper-level undergraduate seminar providing an introduction to the political economy of development. This course explores sources of economic growth, inequality, poverty, and other aspects of development with a particular focus on political institutions. We first explore the patterns of development in the world and then overview basic theories of development. Second, we review the key areas of debate within the study of development, including the role of the state, the consequences of corruption, the effects of natural resources, and gender. The course consists of lectures on theoretical and empirical approaches and the discussion on the literature and cases.
OSPKYOTO 34	Gender and Work in the US and Japan	X		Sources, extent, and consequences of workplace gender inequality in the United States and Japan. Gender disparities in labor force participation, wages, promotions and the types of jobs men and women hold. How societal norms against maternal employment affect women's labor force participation and, consequently, economic growth at a societal level. Employment across different types of jobs, including women in science and engineering fields. Current social and organizational policies designed to reduce gender inequality and spur economic growth. Japan's plan for stimulating the Japanese economy through government policies to persuade Japanese women to join and stay in the paid workforce compared to approaches in the US, which have largely come from the corporate sector.
OSPKYOTO 40M	An Intro to Making: What is EE	X		Is a hands-on class where students learn to make stuff. Through the process of building, you are introduced to the basic areas of EE. Students build a "useless box" and learn about circuits, feedback, and programming hardware, a light display for your desk and bike and learn about coding, transforms, and LEDs, a solar charger and an EKG machine and learn about power, noise, feedback, more circuits, and safety. And you get to keep the toys you build. Prerequisite: CS 106A.
OSPMADR 8A	Cities and Creativity: Cultural and Architectural Interpretations of Madrid		X	Architecture and the city, with a focus on recent currents in the progress of both, such as sustainability, environmentalism and the relationship with nature. Topics underpinned by discussion of theory, and illustrated by a study of the city of Madrid: an example of a hybrid architectural/planning experiential environment that looks to the <u>future with an ambition for modernization</u> .
OSPMADR 48	Migration and Multiculturalism in Spain	X		Dimensions of recent migratory phenomena in Spain. Changes in past decades from a country of emigration to one of immigration, and vice versa. North Africa, Latin America, and Eastern Europe on the one side and the rest of Europe on <u>the other. Social concern and public debate resulting from these changes.</u>
OSPMADR 55	Latin Americans in Spain: Cultural Identities, Social Practices, and Migratory Experience	X		Shift in recent decades from Spain being a country of emigration to one attractive for immigration, especially for people coming from Latin America. Transnational processes of interculturality, integration and assimilation as illustrated by the <u>different ways that immigrant Spaniards relate to Spanish society in Spain.</u>
OSPMADR 62	Spanish California: Historical Issues	X		Spanish exploration and colonization of California from the 16th century to the end of the Spanish colonial period in 1821. Themes include: geographical explorations in the context of European colonial expansion; demographic evolution of Native American inhabitants and immigrant population; general social and economic development of the colony; controversies surrounding the mission system; role of the Pacific coasts of North America in the Spanish enlightenment and in strategies for imperial defense and development in the revolutionary era of the late 18th and early 19th <u>centuries</u> .
OSPMADR 79	Earth and Water Resources' Sustainability in Spain		X	Interdisciplinary focus on the relationship between earth systems and human activities. Nature and distribution of natural resources, their uses and exploitation, environmental impacts associated with exploitation, and sustainable development initiatives, including the restoration and rehabilitation of the land affected by extraction activities. Water management: understanding of the resource and its location; the development of efficient tools; an associated <u>regulatory apparatus; and economics</u> .
OSPOXFRD 11	The European City	X		The long and complex growth of European cities over the last millennium, looking mainly at their physical development but looking also at their economic, social and political evolution. Focus on Oxford, whose history goes back for more than a millennium, but also look for comparative purposes at Florence, Paris and Berlin. Topics to be covered in detail include urban architecture and planning, the provision of housing and public facilities, and the ways in which old cities <u>have responded to the changing needs of the contemporary world.</u>

OSPOXFRD 117W	Gender and Social Change in Modern Britain	X		Changes in the social institutions, attitudes, and values in Britain over the past 20 years with specific reference to shifts in gender relations. Demographic, economic and social factors; review of theoretical ideas. Men's and women's shifting roles in a fast-moving society.
OSPPARIS 73	Enology and Viticulture in France	X		A review of geology, terroir, and wine making practices and a tasting survey of the major wine producing regions of France: Champagne, Burgandy, Rhone, Bordeaux, Loire . . . and the typical grapes and wine of each region.
OSPPARIS 86	Measuring Well-Being and Sustainability in Today's World		X	Explore well-being and sustainability through the lens of the new indicators that are being developed in all corners of social sciences and at the frontier with natural and physical science. Lab to learn how to build an indicator of well-being or sustainability. Historical perspective on well-being and sustainability thinking since Aristotle; overview of standard economic indicators and their limits. Well-being indicators focusing on health, education, happiness, trust, inequality and governance. New research in sustainability indicators. How building new indicators changes policy at the global, national and local level
OSPPARIS 95	Climate Change Economics and Policy		X	Analysis of economic sources of the problem of global climate change, and identification and evaluation of a range of actual or potential public policies to address the problem. Consideration of both international and national efforts to confront climate change, with particular focus on developments in Europe and the US.
OSPPARIS 99	Evolution and Disease	X		At the intersection of evolutionary and medical science, examine some "mismatches", afflictions that develop when our Paleolithic bodies, adapted to a radically different existence, confront our 21st century world. Chronic "diseases of aging" such as cancer and cardiovascular disease and mental and physical degeneration as well as increased incidence of obesity, diabetes and allergies. Factors which may contribute to this situation and preventive measures to address some of these issues, as well as ethical considerations arising from possible solutions, such as genetic and physical enhancement
OSPSANTG 29	Sustainable Cities: Comparative Transportation Systems in Latin America		X	Energy and environmental challenges resulting from the growing size and complexity in Latin American cities. Key issues: way in which public authorities deal with the dynamics of urban growth and complexity; related environmental and energy issues, particularly related to different public transportation models. Systemic approach as seen in Curitiba, Bogota, Santiago, and Medellin. Analysis centering on different approaches used to tackle these related issues; different institutional strategies
OSPSANTG 58	Living Chile: A Land of Extremes	X		Physical, ecological, and human geography of Chile. Perceptions of the Chilean territory and technologies of study. Flora, fauna, and human adaptations to regional environments.
OSPSANTG 71	Santiago: Urban Planning, Public Policy, and the Built Environment	X		Santiago's growth and development over time and in comparison to other mega cities in the world; impact of urban highways on the built environment; shopping malls and the development of new urban sub-centers. Topics: brief history of the city, from 1541 to 1940; urban development since 1940; the 1960 Inter-communal Urban Plan; planning and the configuration of modern Santiago; housing policy as an instrument to combat poverty; social housing policy and Santiago's built environment
OUTDOOR 101	Introduction to Outdoor Education	X		This course explores the historical and philosophical foundations of Outdoor Education and how these concepts have influenced the development of programs at Stanford. Students will be introduced to the varied avenues of outdoor education application across campus.
OUTDOOR 105	Outdoor Living Skills	X		Introduction to essential skills for individual and group sustainability in a backcountry setting including shelter in outdoor environments, equipment selection and use, travel techniques, water and nutrition needs, planning and preparation, and risk management. Course includes the participation in a weekend backcountry experience.
OUTDOOR 105	Behavioral Economics	X		The field of behavioral economics draws on insights from other disciplines, especially psychology, to enrich our understanding of economic behavior. The course will discuss how people may display systematic behavioral patterns that diverge from the predictions of standard economic models, as well as the ways in which economists incorporate those considerations into their theories, and the implications of those theories for market outcomes and public policies. Prerequisites: ECON 50 and ECON 102A. Econ 51 is recommended
PEDS 222	Beyond Health Care: the effects of social policies on health (Same as HUMBIO 122)	X		Available evidence at the national and cross-country level linking social welfare interventions and health outcomes. If and how non-health programs and policies could have an impact on positive health outcomes. Evaluation of social programs and policies that buffer the negative health impact of economic instability and unemployment among adult workers and their children. Examination of safety nets, including public health insurance, income maintenance programs, and disability insurance.
PEDS 223	Human Rights and Global Health	X		Open to medical students, graduate students, and advanced undergraduates. Examines the newly emerging field of human rights and global health, beginning with the essential background into the field of human rights, and the recent emergence of health as a human right. Emphasis is on the pioneering work of Dr. Paul Farmer and Partners in Health and the challenge he and his organization have posed to the conventional wisdom about approaches to combating poor health and disease worldwide. Topics include the "big three" infectious diseases -- tuberculosis, malaria, and HIV/AIDS -- as well as emerging infectious diseases, clean water and sanitation, and malnutrition and famine.
PEDS 225	Humanitarian Aid and Politics	X		Open to medical students, graduate students, and undergraduate students. Examines the moral dilemmas and political realities that complicate the delivery of humanitarian aid, especially when undertaken by the United Nations and non-governmental organizations (NGOs). Emphasis is on what humanitarians call "complex humanitarian emergencies": crises often characterized by famine and/or epidemic disease and typically the result of war and/or civil war. Provides background into the history of humanitarian aid, though focus is on the post-Cold War era, up to the recent crises in Libya and Syria

PHIL 21N	Ethics of Sports (Same as ETHICSOC 21N)	X		This seminar will be focused on the ethical challenges that are encountered in sport. We will focus on the moral and political issues that affect the world of sport and which athletes, coaches, sports commentators and fans are faced with. For instance, we will ask questions such as: what is a fair game (the ethics of effort, merit, success)? Is it ethical to train people to use violence (the ethics of martial arts)? Are divisions by gender categories justified and what should we think of gender testing? Is the use of animals in sport ever justified? Which forms of performance enhancements are acceptable in sport (the ethics of drug use and enhancements through technologies)? Should we ban sports that damage the players' health? Does society owe social support to people who hurt themselves while practicing extreme sports? The class will be structured around small group discussions and exercises as well as brief lectures to introduce key moral and political concepts (such as fairness, equality, freedom, justice, exploitation, etc.). I will also bring guests speakers who are involved in a sport activity at Stanford or who have worked on sports as part of their academic careers. By the end of the seminar, students will have a good understanding of the various ethical challenges that surround the world of sport. They will be able to critically discuss sport activities, norms, modes of assessments and policies (on campus and beyond). They will also be prepared to apply the critical ethical thinking that they will have deployed onto other topics than sports. They will have been introduced to the normative approach to social issues, which consists in asking how things should be rather than describing how things are. They will be prepared to take more advanced classes in ethics, political theory, as well as moral and political philosophy.
PHIL 36	DANGEROUS IDEAS (Same as HISTORY 3D, EALC 36, MUSIC 36H, ENGLISH 71, ARTHIST 36)	X		Ideas matter. Concepts such as equality, progress, and tradition have inspired social movements, shaped political systems, and dramatically influenced the lives of individuals. Others, like freedom of the press, fact versus fiction, and citizenship play an important role in contemporary debates in the United States. All of these ideas are contested, and they have a real power to change lives, for better and for worse. In this one-unit class we will examine these dangerous ideas. Each week, a faculty member from a different department in the humanities and arts will explore a concept that has shaped human experience across time and space. Some weeks will have short reading assignments, but you are not required to purchase any materials.
PHIL 97SI	Homeless Services in Silicon Valley	X		Through hands-on, meaningful projects with local service providers, students will engage with the issue of homelessness in the Bay Area. Students will partner with service providers to create a final deliverable while learning from a diverse set of guest speakers, including formerly unhoused individuals. As Stanford's only course dedicated to homelessness this academic year, it provides students with a unique opportunity to engage with a pressing issue in their neighborhood.
PHIL 170	Ethical Theory (Same as ETHICSOC 170, PHIL 270)	X		A more challenging version of Phil 2 designed primarily for juniors and seniors (may also be appropriate for some freshmen and sophomores - contact professor). Fulfills the Ethical Reasoning requirement. Graduate section (270) will include supplemental readings and discussion, geared for graduate students new to moral philosophy, as well as those with some background who would like more.
PHIL 171	Justice (Same as ETHICSOC 171, PHIL 271, IPS 208, PUBLPOL 103C, POLISCI 336S, POLISCI 103, PUBLPOL 307, POLISCI 136S)	X		Focus is on the ideal of a just society, and the place of liberty and equality in it, in light of contemporary theories of justice and political controversies. Topics include financing schools and elections, regulating markets, discriminating against people with disabilities, and enforcing sexual morality. Counts as Writing in the Major for PoliSci majors.
PHIL 242	Race, Justice, and Integration (Same as EDUC 241, PHIL 142)	X		Recent philosophical research on injustice, race, and the ideal of racial integration.
PHYSICS 81N	Science on the Back of the Envelope	X		Understanding the complex world around us quantitatively, using order of magnitude estimates and dimensional analysis. Starting from a handful of fundamental constants of Nature, one can estimate complex quantities such as cosmological length and time scales, size of the atom, height of Mount Everest, speed of tsunami, energy density of fuels and climate effects. Through these examples students learn the art of deductive thinking, fundamental principles of science and the beautiful unity of nature.
PHYSICS 199	The Physics of Energy and Climate Change	X		Topics include measurements of temperature and sea level changes in the climate record of the Earth, satellite atmospheric spectroscopy, satellite gravity geodesy measurements of changes in water aquifers and glaciers, and ocean changes. The difference between weather fluctuations changes and climate change, climate models and their uncertainties in the context of physical, chemical and biological feedback mechanisms to changes in greenhouse gases and solar insolation will be discussed. Energy efficiency, transmission and distribution of electricity, energy storage, and the physics of harnessing fossil, wind, solar, geothermal, fission and fusion will be covered, along with prospects of future technological developments in energy use and production.
PHYSICS 216	Back of the Envelope Physics	X		Techniques such as scaling and dimensional analysis, useful to make order-of-magnitude estimates of physical effects in different settings. Goals are to promote a synthesis of physics through solving problems, including problems that are not usually thought of as physics. Applications include properties of materials, fluid mechanics, geophysics, astrophysics, and cosmology.
PHYSICS 240	Introduction to the Physics of Energy	X		Energy as a consumable. Forms and interconvertability. World Joule budget. Equivalents in rivers, oil pipelines and nuclear weapons. Quantum mechanics of fire, batteries and fuel cells. Hydrocarbon and hydrogen synthesis. Fundamental limits to mechanical, electrical and magnetic strengths of materials. Flywheels, capacitors and high pressure tanks. Principles of AC and DC power transmission. Impossibility of pure electricity storage. Surge and peaking. Solar constant. Photovoltaic and thermal solar conversion. Physical limits on agriculture.

PHYSICS 241	Introduction to Nuclear Energy	X		Radioactivity. Elementary nuclear processes. Energetics of fission and fusion. Cross-sections and resonances. Fissionable and fertile isotopes. Neutron budgets. Light water, heavy water and graphite reactors. World nuclear energy production. World reserves of uranium and thorium. Plutonium, reprocessing and proliferation. Half lives of fission decay products and actinides made by neutron capture. Nuclear waste. Three Mile Island and Chernobyl. Molten sodium breeders. Generation-IV reactors. Inertial confinement and magnetic fusion. Laser compression. Fast neutron production and fission-fusion hybrids
POLECON 230	Strategy Beyond Markets	X		This course develops techniques and tools to use in firms' strategic interactions beyond the market environment. We'll examine firms' interactions with stakeholders, constituents, and institutions, including interest groups, legislatures, regulatory agencies, courts, international organizations, and the public. Topics covered in the class include: environmental regulation, intellectual property, antitrust, bank bailouts, health care reform, carried interest in private equity, protectionist trade policies, strategic corporate social responsibility, and beyond market strategy for start-ups. The goal is to develop integrated strategies for optimal firm performance that combine strategies within and beyond markets
POLECON 231	Strategy Beyond Markets: Challenges and Opportunities in Developing Economies	X		This course shares significant material with POLECON 230 and the goal of developing integrated strategies for optimal firm performance that combine elements within and beyond markets. POLECON 231 diverges from the base course to delve deeper into issues that are particularly salient for entrepreneurs in emerging and frontier markets. Using a combination of cases from developed and developing countries, we will expand the list of topics considered to include managing political risk and protecting the firm in the face of uncertain and discretionary regulatory environments. The objective is to provide a solid grounding in the techniques explored in 230, while refining skill sets and whetting appetites for investment in higher risk environments
POLECON 683	Political Development Economics	X		This course surveys emerging research in political economics as it applies to developing societies, emphasizing both theoretical and empirical approaches. Topics will include: corruption and "forensic" political economics, institutional reform and democratization, ethnicity, conflict and public goods provision, and the role of trade and financial innovations in political development. The aim of the course is to bring students to the frontier of the field and develop their own research. Graduate level proficiency in microeconomics and empirical methods will be required.
POLISCI 29N	Mixed-Race Politics and Culture (Same as ENGLISH 52N, AFRICAAM 52N)	X		Today, almost one-third of Americans identify with a racial/ethnic minority group, and more than 9 million Americans identify with multiple races. What are the implications of such diversity for American politics and culture? In this course, we approach issues of race from an interdisciplinary perspective, employing research in the social sciences and humanities to assess how race shapes perceptions of identity as well as political behavior in 21st century U.S. We will examine issues surrounding the role of multiculturalism, immigration, acculturation, racial representation and racial prejudice in American society. Topics we will explore include the political and social formation of "race"; racial representation in the media, arts, and popular culture; the rise and decline of the "one-drop rule" and its effect on political and cultural attachments; the politicization of Census categories and the rise of the Multiracial Movement.
POLISCI 31Q	Justice and the City	X		Cities have most often been where struggles for social justice happen, where injustice is most glaring and where new or renewed visions of just communities are developed and tested. What makes a city just or unjust? How have people tried to make cities more just? Why have these efforts succeeded or failed? Each of our sessions will focus on questions like these and include a case study of a particular city, largely with a focus on the United States, including very local cases like San Francisco, Palo Alto and East Palo Alto. The central goal of this class is for you to gain an understanding of the roles of urban design and urban policies in making cities just or unjust places. You will critically engage with some of the debates on cities and justice and gain experience connecting theoretical debates about justice and democracy to empirical data and contemporary work on city design, planning, and policies through readings, our class discussions, and a sustained research project looking a particular city in depth.

POLISCI 43Q	Immigration Crisis? Policy Dilemmas in the US and Europe	X		<p>immigration is a hotly contested social, economic, and political phenomenon in countries throughout the world. People migrate for many reasons, including the desire to start careers, reunite families, and escape oppression. While each story of migration is unique, migration in the modern world has certain commonalities, and these patterns often manifest as political conflict. Labor migration promises economic productivity and efficiency but may threaten existing labor protections and social welfare guarantees to natives. Facilitating migration from failed nation-states may protect the human rights of migrants but introduce security concerns. In the 21st century, the world has witnessed political violence by natives and migrants, both first and second generations including the September 11th attacks, the London bombings, the mass killings in Norway, and the Paris attacks. How can policymakers harness the promises of immigration without succumbing to its pitfalls? Why do some countries respond so differently than others in similar circumstances? When does the meaning of citizenship evolve and when does it stay the same? What lessons do other countries have for the United States as it considers immigration reform?</p> <p>This course is designed to provide students with an overview of immigration law and politics in the United States and other countries, particularly in the European Union. Students will develop the necessary tools to critically analyze immigration policies, starting with the historical evolution of immigration policy in the United States. We will visit Angel Island and discuss the legacy of the Chinese Exclusion Act as well as contemporary immigration politics in San Francisco, a so-called "sanctuary city" for undocumented immigrants. There will also be a screening on La Haine (Hate), an acclaimed French film which chronicles the challenges of immigrant integration. Students will study the economics of immigration and the politics of refugees in the context of post-9/11 security dilemmas. Students will design a concrete immigration policy proposal.</p>
POLISCI 97X	Animal behavior: sex, death, and sometimes food!	X		<p>Preference to freshman. Behavior is what makes animals special (thirsty plants don't walk to water), but why do animals behave the way they do? What does their behavior tell us about their inner lives, and about ourselves? What do lipstick and cuckoos and fireflies have in common? Why would nobody want to be a penguin? What do mice say to each other in their pee-mail? Learning how to think about questions like these gives us a unique perspective on the natural world. Format: Discussion and criticism of video examples, documentaries, and research papers. Topics: History and approaches to animal behavior; development of behavior, from genetics to learning; mechanisms of behavior, from neurons to motivation; function of behavior, from honest signals to selfish genes; the phylogeny of behavior, from domestication to speciation; and modern applications of behavior, from abnormal behavior, to conservation, to animal welfare, and animal consciousness.</p>
POLISCI 101	Introduction to International Relations	X		<p>Approaches to the study of conflict and cooperation in world affairs. Applications to war, terrorism, trade policy, the environment, and world poverty. Debates about the ethics of war and the global distribution of wealth.</p>
POLISCI 101	Freshwater Systems	X		<p>Integrated water resource management and how this applies across the globe, comparing strategies and results in the developing and more developed world. Ethics, values and politics of water and the management of extremes such as drought and flood. Ecology and hydrology in an urban context, along with important current issues such as stormwater and water sensitive urban design. Construction of a well, a water tank, and a pit latrine. Community service working with a local catchment management group on riparian and wetland restoration work. Field work complements lectures.</p>
POLISCI 136R	Introduction to Global Justice (Same as INTNLREL 136R, POLISCI 336, ETHICSOC 136R, PHIL 76)	X		<p>This course provides an overview of core ethical problems in international politics, with special emphasis on the question of what demands justice imposes on institutions and agents acting in a global context. The course is divided into three sections. The first investigates the content of global justice, and comprises of readings from contemporary political theorists and philosophers who write within the liberal contractualist, utilitarian, cosmopolitan, and nationalist traditions. The second part of the course looks at the obligations which global justice generates in relation to five issues of international concern: global poverty, climate change, immigration, warfare, and well-being of women. The final section of the course asks whether a democratic international order is necessary for global justice to be realized.</p>
POLISCI 147P	The Politics of Inequality (Same as PUBLPOL 247)	X		<p>This course is about the distribution of power in contemporary democratic societies, and especially in the US: who governs? Is there a "power elite," whose preferences dominate public policy making? Or, does policy reflect a wide range of interests? What is the relationship between income and power? What are the political consequences of increasing income inequality? How do income differences across racial and ethnic groups affect the quality of their representation? What are effective remedies for unequal influence? Finally, which institutions move democratic practice furthest towards full democratic equality? This course will address these questions, focusing first on local distributions of power, and then considering the implications of inequality in state and national politics. Students will have the opportunity to study income inequality using income and labor force surveys in a mid-term assignment. Then, in a final paper, students will conduct an empirical examination of the implications of income inequality for American democracy.</p>

POLISCI 147P	Bioethics: the Biotechnological Revolution, Human Rights and Politics in the Global Era	X		Birth and development of the philosophical field of bioethics based on advances in several fundamental fields of science and technology, including molecular and cell biology, information technology, neurosciences and converging technologies. Challenges for society and ethical and political issues created by new advances and opportunities for individuals and populations. Philosophical approaches developed in the Italian as well as in the European debate; special attention to controversy about the freedom of scientific research, new conditions of procreation, birth, cures, and death. Complexity of the challenges posed by the 'biotechnological revolution'.
POLISCI 236S	Theories and Practices of Civil Society, Philanthropy, and the Nonprofit Sector (Same as ETHICSOC 232T, POLISCI 236)	X		What is the basis of private action for the public good? How are charitable dollars distributed and what role do nonprofit organizations and philanthropic dollars play in a modern democracy? In the 'Philanthropy Lab' component of the course, students will award \$100,000 in grants to local nonprofits. Students will explore how nonprofit organizations operate domestically and globally as well as the historical development and modern structure of civil society and philanthropy. Readings in political philosophy, history, political sociology, and public policy.
POLISCI 236S	Biosocial Medicine: The Social, Psychological, and Biological Determinants of Behavior and Wellbeing (Same as EDUC 205, HUMBIO 65)	X		Explores how social forces, psychological influences, and biological systems combine to affect human behavior in early childhood, in the educational experience, and throughout the life course. Examines how behaviors are linked to well-being. Uses a flipped classroom model, in which a series of lectures are available for students to view on-line before class. In-class time then focuses on case studies from published research. Undergraduates enroll for 3 units. Students enrolling for 3 units attend two meetings per week; students enrolling for 2 units attend one meeting per week.
POLISCI 346P	The Dynamics of Change in Africa (Same as AFRICAST 301A, HISTORY 246, HISTORY 346, POLISCI 246P)	X		Crossdisciplinary colloquium; required for the M.A. degree in African Studies. Open to advanced undergraduates and PhD students. Addresses critical issues including patterns of economic collapse and recovery; political change and democratization; and political violence, civil war, and genocide. Focus on cross-cutting issues including the impact of colonialism; the role of religion, ethnicity, and inequality; and Africa's engagement with globalization.
PSYCH 383	International Conflict Resolution (Same as IPS 250)	X		This seminar examines the challenges of managing and resolving intractable political and violent intergroup and international conflicts. Employing an interdisciplinary approach drawing on social psychology, political science, game theory, and international law, the course identifies various tactical, psychological, and structural barriers that can impede the achievement of efficient solutions to conflicts. We will explore a conceptual framework for conflict management and resolution that draws not only on theoretical insights, but also builds on historical examples and practical experience in the realm of conflict resolution. This approach examines the need for the parties to conflicts to address the following questions in order to have prospects of creating peaceful relationships: (1) how can the parties to conflict develop a vision of a mutually bearable shared future; (2) how can parties develop trust in the enemy; (3) how can each side be persuaded, as part of a negotiated settlement, to accept losses that it will find very painful; and (4) how do we overcome the perceptions of injustice that each side are likely to have towards any compromise solution? We will consider both particular conflicts, such as the Israeli-Palestinian conflict and the South African transition to majority rule, as well as cross-cutting issues, such as the role international legal rules play in facilitating or impeding conflict resolution, the intragroup dynamics that affect intergroup conflict resolution efforts, and the role of criminal accountability for atrocities following civil wars.
PUBLPOL 85	Environmentalism in California		X	Alternative Spring Break: With climate change posed to be one of the most pressing issues of the 21st Century, environmental preservation is emerging at a top priority. In addition to the federal government, state and local governments regulate the environment. In this course, we will learn about what environmental policy looks like in at the state level in California. Since the Golden State has an ambitious environmental preservation plan, there will be a lot of content. To make this class more manageable, we will be focusing on two areas specifically: water and energy. Finally, we will spend that last few weeks of the course learning about environmental justice, and specifically, how climate change impacts Indigenous communities in California and how the state is mitigating the impact. All major backgrounds are welcome.
PUBLPOL 101	Politics and Public Policy (Same as POLISCI 123, PUBLPOL 201, POLISCI 102, AMSTUD 123X)	X		American political institutions (the Presidency, Congress, and the Court) and political processes (the formation of political attitudes and voting) have for some time now been criticized as inadequate to the task of making modern public policy. Against the backdrop of American culture and political history we examine how public policy has been and is being made. We use theories from Political Science and Economics to assess the state of the American system and the policy making process. We use case studies and lectures to analyze contemporary issues including environmental policy, taxes and spending, gun control, economic growth and inequality and mobility. In some of these issue areas we use comparative data from other countries to see how the U.S. is doing relative to other countries. In addition to class room lecture and discussion, student groups are formed to analyze policy issues of relevance to them. Undergraduate Public Policy students are required to enroll in this class for five units.
PUBLPOL 101	Between Toleration and Persecution: Iran and its Minorities in the Twentieth Century (Same as JEWISHST 84S)	X		What does it mean to be Jewish or Christian in a country where most citizens are categorized as Shi'i Muslims? How have Kurds and Azeris figured into Iranian national and political rhetoric? What has it meant to identify as transgender or transsexual? This course explores religious, ethnic, and sexual minority groups in Iran in the twentieth century. Topics include minority rights, identity formation, minorities' involvement in political movements, the impact of westernizing efforts on minorities, and the Iranian diaspora.

PUBLPOL 103F	Ethics of Truth in a Post-Truth World (Same as PUBLPOL 203F)	X		This course will explore changing notions of truth in a world in which technology, global risks, and societal developments are blurring the boundaries of humanity and boring through traditional notions of nation states, institutions, and human identity. We will ask one over-arching question: does truth matter anymore? If so, why and how? If not, why not? Either way, how does truth relate to ethical decision-making by individuals and institutions and to an ethical society? Five themes will organize our exploration of more specific topics: honesty; identity; memory; authenticity and integrity; and religious truth. Examples of topics to be explored include, among others: fake news; President Trump's campaign strategy; Syrian refugees; University history (Rhodes, Georgetown slavery, Yale Calhoun College...); new questions in gender and racial identity; Chinese beautifying app Meitu and other social media "truth modifiers"; policy questions relating to the sharing economy; and Brexit. Scotty McClellan will explore truth through major literary characters and the impact of religion on truth. We will consider how we determine and verify the truth; how we "do" truth; the role of truth in ethical decision-making; the importance of truth to effective ethical policy; and the relationship of the truth to a life well lived.
PUBLPOL 135	Regional Politics and Decision Making in Silicon Valley and the Greater Bay Area	X		Dynamics of regional leadership and decision making in Silicon Valley, a complex region composed of 40 cities and four counties without any overarching framework for governance. Formal and informal institutions shaping outcomes in the region. Case studies include transportation, workforce development, housing and land use, and climate change.
PUBLPOL 154	Politics and Policy in California	X		State politics and policy making, including the roles of the legislature, legislative leadership, governor, special interests, campaign finance, advocacy groups, ballot initiatives, state and federal laws, media, and research organizations. Case studies involving budgets, education, pensions, health care, political reform, environmental reforms, water, transportation and more. Evaluation of political actions, both inside and outside of government, that can affect California policy and social outcomes. Meetings with elected officials, policymakers, and advocates in class and during a <u>day-long field trip to Sacramento</u> .
PUBLPOL 158	Housing & Community Development--Policy and Practice (Same as URBANST 168)	X		How federal, state and local governments have worked with private and nonprofit sector actors in creating housing, as well as downtown, waterfront and neighborhood development. Legal and financial mechanisms, tax policy, reuse of <u>historic structures, affordable shelter.</u>
PUBLPOL 190	Indigenous Cultural Heritage: Protection, Practice, Repatriation (Same as ARTHIST 490A, ARTHIST 190A)	X		This interdisciplinary seminar explores pressing questions relating to the protection, practice and repatriation of the cultural heritage of Indigenous peoples from North America and beyond. Using an innovative combination of in-class lectures and videos of interviews with renowned experts, including Indigenous leaders, scholars, artists and performers and museum professionals from around the world, this seminar will explore and problematize, among other subjects: the impact of colonialism, urbanization and other political, legal, economic, religious and cultural forces on understandings and definitions of "indigenous" and "cultural heritage"; the development of international law relating to Indigenous peoples' cultural rights; international, domestic, and tribal heritage protection and repatriation laws/initiatives including the 2007 United Nations Declaration on the Rights of Indigenous Peoples (UNDRIP), the 1990 US Native American Graves Protection and Repatriation Act (NAGPRA), and others; past and present Western museum practices and guidelines relating to display, preservation, provenance research and repatriation of indigenous cultural material; the meaning of repatriation to Indigenous peoples and other stakeholders; and resolving repatriation disputes, including by alternative dispute resolution (ADR) processes. While case studies will relate primarily to Indigenous peoples of North America, comparisons will be drawn with the situation of Indigenous peoples in other regions, such as Oceania and Russia. Each week students will brainstorm actionable ideas for amending/supplementing current frameworks in order to give force to the cultural rights enumerated in UNDRIP. The overall seminar experience will involve discussions of lectures and video content, assigned readings, quizzes, a class visit to the Cantor Center Native Americas collection, and visits to our classroom by experts.
PUBLPOL 222	Biosecurity and Bioterrorism Response (Same as BIOE 122, PUBLPOL 122, EMED 222, EMED 122)	X		The biological causes and consequences of anthropogenic and natural changes in the atmosphere, oceans, and terrestrial and freshwater ecosystems. Topics: glacial cycles and marine circulation, greenhouse gases and climate change, tropical deforestation and species extinctions, and human population growth and resource use. Prerequisite: <u>Biology or Human Biology core or graduate standing.</u>
PUBLPOL 305B	Public Policy and Social Psychology: Implications and Applications (Same as IPS 207B, PSYCH 216)	X		Theories, insights, and concerns of social psychology relevant to how people perceive issues, events, and each other, and links between beliefs and individual and collective behavior will be discussed with reference to a range of public policy issues including education, public health, income and wealth inequalities, and climate change. Specific topics include: situationist and subjectivist traditions of applied and theoretical social psychology; social comparison, dissonance, and attribution theories; stereotyping and stereotype threat, and sources of intergroup conflict and misunderstanding; challenges to universality assumptions regarding human motivation, emotion, and perception of self and others; also the general problem of producing individual and collective changes in norms and behavior.

PUBLPOL 342	Energy Efficiency: Technology, Policy, and Investment (Same as MS&E 442)		X	Provide students with a basic understanding of the technologies, policies, and investments behind energy efficiency. Explores each of these dimensions, and their interplay, through structured lectures and expert perspectives from leading professionals and practitioners. The seminar will first survey energy efficiency historically, reviewing technology and policy development, funding support, accomplishments at the state and federal levels, and key stakeholders. The second part of the seminar will focus on innovation in energy efficiency, including its role in climate change. Three areas are anticipated for study: new technologies and energy efficiency's role in the changing grid, new policies and the use of data analytics, and new entrants and investment strategies.
PWR 1BK	Writing & Rhetoric 1: Writing What You Eat: The Rhetoric of Food	X		In this course, we will focus on the rhetoric of food in order to explore how our relationship to what we eat is reflected in writing about ourselves, our society, and our world. Essays, recipes, blog posts, and newspaper articles are some of the genres we will examine in order to explore how issues of identity, community, ethics, and wellness can be expressed in food writing. How does what we choose to eat reflect on how we see ourselves and the world around us? What responsibilities do we have, if any, as consumers of food in one of the world's richest nations? For more information about PWR 1, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> . For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . Enrollment is handled by the PWR office.
PWR 1EP	Writing & Rhetoric 1: The Rhetoric of Global Development and Social Change	X		Rhetorical and contextual analysis of readings; research; and argument. Focus is on development of a substantive research-based argument using multiple sources. Individual conferences with instructor. See <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> .
PWR 1LO	Writing & Rhetoric 1: What Are We Trying to Sustain? Rhetoric of Nature's Values and Services		X	With increasing rates of environmental impacts from human activity, communities across the planet face challenges for sustainability. Given the many benefits we derive from nature - from cultural and spiritual benefits, to basic goods like food and water, to economic benefits from the use of natural resources - defining what we value and what we wish to sustain is a top priority. This class will examine diverse perspectives on the value and services we derive from nature and consider challenges for balancing multiple uses of nature in the context of sustainable resource management and conservation. For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . For more information about PWR 1, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> . Enrollment is handled by the PWR office.
PWR 1LPG	Writing & Rhetoric 1: Power Lines and Water Pipes: Writing The Global City Through Infrastructure	X		What can power lines, water pipes, and fibre optic cables tell us about how different groups of people navigate life in global cities? While such infrastructures are often considered to be the mere "background" of socio-cultural life in cities, this course will center on them and their rhetorical contexts in order to explore how opportunity and inequality are imagined and discussed in urban spaces. We will contemplate how knowledge, relations of power, and practices of governance work within the framework of deep rhetorical analysis of urban infrastructures. For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . For more information about PWR 1, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> . Enrollment is handled by the PWR office.
PWR 1MGD	Writing & Rhetoric 1: Who speaks for nature? Rhetorics of environmentalism and justice		X	The last hundred years have seen organized environmentalism become a major force on the world stage. But the environment is still essentially contested. Who is at risk from environmental problems? What environmental problems should be prioritized? And who should be able to speak out as authentic protectors of the earth? In this course, we examine the ways that environmental and conservation writers from classic environmental writers to contemporary activists talk about nature to see how close readings of their work highlight fundamental disagreements about justice and politics in societies across the globe. For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . For more information about PWR 1, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> . Enrollment is handled by the PWR office.
PWR 1MS	Writing & Rhetoric 1: Seeing Nature: The Power of Environmental Visual Rhetoric		X	Rhetorical and contextual analysis of readings; research; and argument. Focus is on development of a substantive research-based argument using multiple sources. Individual conferences with instructor. See <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> .
PWR 1SI	Writing & Rhetoric 1: Super-Storms, Polar Bears, and Droughts: The Rhetoric of Climate Change		X	Rhetorical and contextual analysis of readings; research; and argument. Focus is on development of a substantive research-based argument using multiple sources. Individual conferences with instructor. See <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-1">https://undergrad.stanford.edu/programs/pwr/courses/pwr-1</a> .
PWR 2DHA	Writing & Rhetoric 2: Action Research: Making Time for Social Justice	X		Further work in developing skills in argument and research-based writing, with emphasis on both written and oral/multimedia presentation of research. For more information about PWR 2, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-2">https://undergrad.stanford.edu/programs/pwr/courses/pwr-2</a> . For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . Enrollment is handled by the PWR office.
PWR 2DHA	California's Minority-Majority Cities (Same as CSRE 260, HISTORY 260)	X		Historical development and the social, cultural, and political issues that characterize large cities and suburbs where communities of color make up majority populations. Case studies include cities in Los Angeles, Santa Clara, and Monterey counties. Comparisons to minority-majority cities elsewhere in the U.S. Service Learning Course (certified by Haas Center).
PWR 2EPB	Writing & Rhetoric 2: The Rhetoric of Social Justice and Climate Change		X	Further work in developing skills in argument and research-based writing, with emphasis on both written and oral/multimedia presentation of research. For more information about PWR 2, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-2">https://undergrad.stanford.edu/programs/pwr/courses/pwr-2</a> . For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . Enrollment is handled by the PWR office.

PWR 2KM	Writing & Rhetoric 2: A Planet on the Edge: The Rhetoric of Sustainable Energy		X	Prerequisite: PWR 1. Further work in developing skills in argument and research-based writing, with emphasis on both written and oral/multimedia presentation of research. Focus on the rhetoric and ethics of sustainable energy, investigating both the alarmism and optimism which fuel this debate. See <a href="http://www.stanford.edu/dept/undergrad/cgi-bin/drupal/ual/AP_univ_req_PWR_Courses.html">http://www.stanford.edu/dept/undergrad/cgi-bin/drupal/ual/AP_univ_req_PWR_Courses.html</a> .
PWR 2KTA	Writing & Rhetoric 2: A Rebel With A Cause: The Rhetoric of Giving a Damn	X		In this course, we will explore a variety of movements from marriage equality and civil rights to climate change. We will also examine individuals and the manner in which they advance the causes that matter to them most, including astrophysicist Neil deGrasse Tyson, anti-racism activist Tim Wise, and equal education activist Malala Yousafzai. Ultimately, students will use knowledge gained to assist delivery of research, both in written and oral form, in cultural contexts and from the disciplinary perspective of students' choosing. For more information about PWR 2, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-2">https://undergrad.stanford.edu/programs/pwr/courses/pwr-2</a> . For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . Enrollment is handled by the PWR office.
PWR 2KTA	Camera as Witness: International Human Rights Documentaries	X		Rarely screened documentary films, focusing on global problems, human rights issues, and aesthetic challenges in making documentaries on international topics. Meetings with filmmakers.
PWR 2RL	Writing & Rhetoric 2: The Rhetoric of the Natural and Beyond		X	Prerequisite: PWR 1. Further work in developing skills in argument and research-based writing, with emphasis on both written and oral/multimedia presentation of research. See <a href="http://www.stanford.edu/dept/undergrad/cgi-bin/drupal/ual/AP_univ_req_PWR_Courses.html">http://www.stanford.edu/dept/undergrad/cgi-bin/drupal/ual/AP_univ_req_PWR_Courses.html</a> .
PWR 2SC	Writing & Rhetoric 2: Are We There Yet?: The Rhetoric of Mobility	X		Further work in developing skills in argument and research-based writing, with emphasis on both written and oral/multimedia presentation of research. For more information about PWR 2, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/pwr-2">https://undergrad.stanford.edu/programs/pwr/courses/pwr-2</a> . For full course descriptions, see <a href="https://vcapwr-catalog.stanford.edu">https://vcapwr-catalog.stanford.edu</a> . Enrollment is handled by the PWR office.
PWR 2SC	CAPITALS: How Cities Shape Cultures, States, and People (Same as DLCL 100, FRENCH 175, ITALIAN 175, COMPLIT 100, HISTORY 206E, ILAC 175, URBANST 153)	X		This course takes students on a trip to eight capital cities, at different moments in time: Renaissance Florence, Golden Age Madrid, Colonial Mexico City, Enlightenment and Romantic Paris, Existential and Revolutionary St. Petersburg, Roaring Berlin, Modernist Vienna, and bustling Buenos Aires. While exploring each place in a particular historical moment, we will also consider the relations between culture, power, and social life. How does the cultural life of a country intersect with the political activity of a capital? How do large cities shape our everyday experience, our aesthetic preferences, and our sense of history? Why do some cities become cultural capitals? Primary materials for this course will consist of literary, visual, sociological, and historical documents (in translation); authors we will read include Boccaccio, Lope de Vega, Sor Juana, Montesquieu, Baudelaire, Dostoyevsky, Irmgard Keun, Freud, and Borges.
PWR 2SN	Writing & Rhetoric 2: Rhetoric of Activism	X		Prerequisite: PWR 1. Further work in developing skills in argument and research-based writing, with emphasis on both written and oral/multimedia presentation of research. See <a href="http://www.stanford.edu/dept/undergrad/cgi-bin/drupal/ual/AP_univ_req_PWR_Courses.html">http://www.stanford.edu/dept/undergrad/cgi-bin/drupal/ual/AP_univ_req_PWR_Courses.html</a> .
PWR 91EC	Intermediate Writing: Farmers, Scientists, & Activists: Public Discourse of Food Economies	X		What are the possibilities in rethinking our food, the way we talk about it, the way we grow it, and the way we eat it? In this course, you will be paired with local organizations concerned with food economies, such as food activists, food banks, farmers, and farm collectives, to collaboratively draft and produce writing specific to the client. You will analyze and respond to a variety of professional writing situations, and practice project management, focusing on benchmarking and deliverables. The end result will be a multimodal, collaboratively-produced document or set of documents you can add to your public-facing portfolios. Students taking this courses as part of the Notation in Science Communication can include their final project in their NSC e-portfolio. This course fulfills the advanced PWR requirement for the Notation in Science Communication (NSC). Prerequisite: first two levels of the writing requirement or equivalent transfer credit. For video course description, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/advanced-courses/farmers-scientists-activists-public-discourse-food-economies/">https://undergrad.stanford.edu/programs/pwr/courses/advanced-courses/farmers-scientists-activists-public-discourse-food-economies/</a> . (Cardinal Course certified by the Haas Center)
PWR 194MF	Topics in Writing & Rhetoric: In the Margins: Race, Gender and the Rhetoric of Science	X		Every day a new headline alerts us to the lack of race and gender diversity in the tech sector in Silicon Valley. At the same time, science and technology are often lauded as objective systems capable of producing color- and gender-blind truths and social good for all of us. This course pushes beyond the headlines and the hashtags to think about the complex relationship between gender, race and science. Together we will research chronically understudied voices and contributions in the history of science and technology and have the opportunity to read and participate in some of the efforts to highlight their stories through a Wikipedia edit-a-thon and final research project. We will also rigorously think through why the historical and current under-representation of women and people of color matters for the questions that are asked, methodologies that are used, and science and technology that is eventually produced. This course fulfills the advanced PWR requirement for the Notation in Science Communication (NSC). Prerequisite: first two levels of the writing requirement or equivalent transfer credit. For topics, see <a href="https://undergrad.stanford.edu/programs/pwr/courses/advanced-pwr-courses/">https://undergrad.stanford.edu/programs/pwr/courses/advanced-pwr-courses/</a> .
SINY 122	The Agile City		X	Examine the economic, cultural and environmental forces transforming the urban experience globally and understand how cities become agile to adapt to rapidly evolving urban challenges. This course would draw from case studies in New York and elsewhere, using guest experts and site visits or walking tours.
SIW 144	Energy, Environment, Climate and Conservation Policy: A Washington, D.C. Perspective		X	no course description

SOC 8	Sport, Competition, and Society	X		This course uses the tools of social science to help understand debates and puzzles from contemporary sports, and in doing so shows how sports and other contests provide many telling examples of enduring social dynamics and larger social trends. We also consider how sport serves as the entry point for many larger debates about the morality and ethics raised by ongoing social change.
SOC 14N	Inequality in American Society	X		An overview of the major forms of inequality in American society, their causes and consequences. Special attention will be devoted to public policy associated with inequality.
SOC 134	Education, Gender, and Development (Same as EDUC 197, FEMGEN 297)	X		Theories and perspectives from the social sciences relevant to the role of education in changing, modifying, or reproducing structures of gender differentiation and hierarchy. Cross-national research on the status of girls and women and the role of development organizations and processes.
SOC 137	Global Inequality	X		Absolute world poverty has declined considerably in the last twenty years, but elites have gained disproportionately from the growth of the global economy, leading to serious concerns about inequality in several countries, as well as in global policy circles. This discussion-based seminar explores how global capitalism affects worldwide inequality. Topics include the evolution, causes, and structure of global inequality, the links between inequality and human development, and potential solutions to global inequality.
SOC 151	From the Cradle to the Grave: How Demographic Processes Shape the Social World (Same as SOC 251)	X		Comparative analysis of historical, contemporary, and anticipated demographic change. Draws on case studies from around the world to explore the relationship between social structure and population dynamics. Introduces demographic measures, concepts and theory. Course combines lecture and seminar-style discussion.
SOC 157	Ending Poverty with Technology (Same as PUBLPOL 147)	X		There are growing worries that new technologies may eliminate work, increase inequality, and create a large dependent class subsisting on transfers. But can technology instead be turned against itself and used to end poverty? This class explores the sources of domestic poverty and then examines how new technologies might be developed to eliminate poverty completely. We first survey existing poverty-reducing products and then attempt to imagine new products that might end poverty by equalizing access to information, reducing transaction costs, or equalizing access to training. In a follow-up class in the spring quarter, students who choose to continue will select the most promising ideas, continue to develop them, and begin the design task within Stanford's new Poverty and Technology Lab.
SOC 214	Economic Sociology (Same as SOC 114)	X		The sociological approach to production, distribution, consumption, and markets, emphasizing the impact of norms, power, social structure, and institutions on the economy. Comparison of classic and contemporary approaches to the economy among the social science disciplines. Topics: consumption, labor markets, organization of professions such as law and medicine, the economic role of informal networks, industrial organization, including the structure and history of the computer and popular music industries, business alliances, capitalism in non-Western societies, and the transition from state socialism in E. Europe and China.
SOC 218	Social Movements and Collective Action (Same as SOC 118)	X		Why social movements arise, who participates in them, the obstacles they face, the tactics they choose, and how to gauge movement success or failure. Theory and empirical research. Application of concepts and methods to social movements such as civil rights, environmental justice, antiglobalization, and anti-war.
SOC 235	Poverty, Inequality, and Social Policy in the United States (Same as SOC 135)	X		Over the last three decades, inequality in America has increased substantially. Why has this happened, and what can be done about it? The course will begin by surveying the basic features of poverty, inequality, and economic mobility in the 21st century. From here we will discuss issues related to discrimination, education and schools, criminal justice, and the changing nature of the family as forces that shape inequality. We will also focus on the main social policy options for addressing inequality in the United States, including income support for the poor, taxing higher incomes, efforts to encourage philanthropy, and other institutional reforms.
SOC 242	Sociology of Gender (Same as SOC 142, FEMGEN 142, FEMGEN 242)	X		The aim of this course is to provide students with an understanding of the sociological conceptualization of gender. Through the sociological lens, gender is not an individual attribute or a role, but rather a system of social practices that constructs two different categories of people men and women and organizes social interaction and inequality around this difference. First we will explore what "gender" is according to sociologists and the current state of gender inequality in the labor market, at home, and at school. We will then investigate how gender structures our everyday lives through the individual, interactional, and institutional levels. Finally, we will discuss avenues for reducing gender inequality. Throughout the course, we will prioritize reading, evaluating, and questioning sociological theory and research on gender."

SOC 252	The Social Determinants of Health (Same as SOC 152)	X		Our social and physical environments are widely recognized as playing a central role in shaping patterns of health and disease within and across populations. Across disciplines, a key question has been: How does the social environment gets under the skin to influence health? In this course, we will explore how social scientists, epidemiologists, public health experts, and physicians tackle this question. Reflecting both qualitative and quantitative approaches, we will draw on literatures in social science, public health, and medicine to understand the processes through which our environments shape health outcomes. We will examine a number of key social determinants of health, wellness and illness. These determinants include socioeconomic status, gender, race/ethnicity, religious affiliation, neighborhoods, environments, social relationships, and health care. We will also discuss a host of mechanisms through which these factors are hypothesized to influence health, such as stress, lifestyle, and access to health resources. An overall theme will be how contextual factors that adversely affect health are inequitably distributed and thereby fuel health disparities. Through all of this, we will assess the promise of public policy, planning and research for generating more equitable health outcomes across society.
SOC 310	Political Sociology	X		Theory and research on the relationship between social structure and politics. Social foundations of political order, the generation and transformation of ideologies and political identities, social origins of revolutionary movements, and social consequences of political revolution.
SOC 312W	Workshop: Political Sociology, Social Movements, and Collective Action	X		Faculty and student presentations of ongoing research on topics including: social movement and organizations, and the relationship between them; democracy movements; legislative and policy outcomes; and collective action tactics, strategies, and trajectories.
SOC 312W	Building Paris: Its History, Architecture, and Urban Design	X		The development of Parisian building and architecture from the 17th century to the present. Interaction of tradition and innovation in its transformation and its historical, political, and cultural underpinnings. Visits and case studies throughout Paris illustrate the formation of the city landscape and its culture.
SOC 341W	Workshop: Inequality	X		Causes, consequences, and structure of inequality; how inequality results from and shapes social classes, occupations, professions, and other aspects of the economy. Research presentations by students, faculty, and guest speakers. Discussion of controversies, theories, and recent writings.
SOC 341W	Bridging the Civil-Military Divide: Military Service as Public Service in the 21st Century	X		Alternative Spring Break: Today, fewer than 0.5 percent of Americans serve in the military, as compared to roughly 12 percent during the second World War. This has led to a widening gap in knowledge about the military, its members and the functions they perform, as well as its basic structure and tradition of service. This course is intended to introduce students to the notion of military service as public service and explore how misperceptions on both sides affect the civil-military divide. We will explore military service from the life of an enlisted soldier deployed to Afghanistan, to an officer working at the Pentagon on broad national security strategy. How does society conceive of a soldier, a sailor, an airman, a marine? How do Americans perceive military service and what role do service members play in our society?
SOC 350W	Workshop: Migration, Ethnicity, Race and Nation	X		Current theories and research, recent publications, and presentations of ongoing research by faculty and students.
SOC 350W	Building Big: Architecture and Monumentality in Classical Antiquity	X		This seminar explores the interrelated mechanics, aesthetics, and economics of the monumental construction programs that characterized Classical Greece and Rome. Using archaeological remains of architecture alongside the crucial corpus of written testimony (especially Vitruvius), we investigate how and why immense resources were lavished on monumental projects in antiquity and what practical impact such projects might have had on ancient citizens and spectators, their cities, and the economy more broadly.
SOC 354	Welfare State (Same as SOC 254)	X		This seminar introduces students to the key literature, questions, and debates about the modern welfare state. Emergence, growth, and purported demise of the welfare state. American welfare state in comparative perspective. Social and political factors affecting state development including political parties, labor markets, gender, demographic change, and immigration.
SOC 374	Philanthropy and Civil Society (Same as EDUC 374, POLISCI 334)	X		Cross-listed with Law (LAW 781), Political Science (POLISCI 334) and Sociology (SOC 374). Associated with the Center for Philanthropy and Civil Society (PACS). Year-long workshop for doctoral students and advanced undergraduates writing senior theses on the nature of civil society or philanthropy. Focus is on pursuit of progressive research and writing contributing to the current scholarly knowledge of the nonprofit sector and philanthropy. Accomplished in a large part through peer review. Readings include recent scholarship in aforementioned fields.
SOC 378	Seminar on Institutional Theory and World Society	X		Sociological analyses of the rise and impact of the expanded modern world order, with its internationalized organizations and globalized discourse. Consequences for national and local society: education, political organization, economic structure, the environment, and science. The centrality of the individual and the rationalized organization as legitimated actors.

SOMGEN 211	Preparation and Practice: Science Policy	X		<p>Through tailored lecture, case study, and a practical final project, academic and professional leaders will help you gain insight into the science policy industry and the skills necessary to succeed within the various positions and levels available within it. This course aims to demystify the U.S. science policy process and teach both how policy affects scientific funding and administration, and how science is used to create and influence the creation of law and policy in the U.S. This course will be taught in two parts. The first part, to be completed prior to the first class outlines the basic structure of the US government, and fundamental issues in US political system, and refresh students who haven't encountered basic civics since high school, this introductory material will cover the structure of the US government, the governance of key agencies, broad concepts of federalism and shared federal and power, the political party system, and a brief and general modern history of the role of science in policy making. The short class online class will acquaint students with the structure of law, regulations and other appropriate policy documents. This online class will be available asynchronously two weeks prior to the live course. A faculty member will moderate this course and give feedback to students on short assignments designed to ensure they understand basic concepts and are prepared for the live class. The second part, taught over five days in 3-hour in-class sessions, will review four key concepts: 1) who's who and how they work. The structure and function of the executive branch and its control over science-based agencies, and the legislative oversight and budgeting of these agencies. 2) The policy making process. The policy making process, and the role of science in creating policy. This section will include broad overviews of the legislative process, competing political theory, and risk/assessment/risk management models, as well as discussion of the role of scientists as agency employees and officials, and scientists as experts, interested parties and reviewers. 3) Government funding science. the funding of science by government, including the mechanisms, processes and dominant theories of science funding, as well as the practical and political tensions around science funding, and the reporting and accountability standards to which recipients are subject. 4) Issues, theories and trends in science and policy. The ecology of innovation and policy in the US. Sometimes referred to as the emerging "science of science policy". This final section will review a variety of cross-cutting issues in science policy development, including innovation theory, the role of uncertainty, and a discussion of the government's role as a developer and repository of science data, and other current topics in the <u>relationship between science and government.</u></p>
SOMGEN 215	Ancient Urbanism (Same as CLASSICS 153, ARCHLGY 153)	X		<p>Archaeology of Greek, Roman and early Islamic cities and urbanism in the Mediterranean and western Asia. Comparison and contrast of the shaping role of religion and politics; definitions of public and private space, monumental buildings, houses, streets, infrastructure. Special themes are city and country connections; the problems of giant cities; cities in the longue durée. Case studies include Athens, Olynthos, Rome, Pompeii, Constantinople, <u>Damascus and Cairo.</u></p>
SOMGEN 260	Preparing for Community, Health and Learning through Service in Sri Lanka		X	<p>Preparation course for students attending the Bing Overseas Study Program in Sri Lanka. Focuses on specific topics relevant to Sri Lanka, including: water issues, effects of war and natural disaster on population health, maternal and child health, and etiquette and basic language skills for visitors. Explores the Sarvodaya model of development together with the World Health Organization's Sustainable Development Goals. Required for BOSP students; open to all students <u>interested in Sri Lanka and global health.</u></p>
SOMGEN 207	Theories of Change in Global Health	X		<p>Open to graduate students studying in any discipline whose research work or interest engages global health. Upper-class undergraduates who have completed at least one of the prerequisite courses and who are willing to commit the preparatory time for a graduate level seminar class are welcome. The course undertakes a critical assessment of how different academic disciplines frame global health problems and recommend pathways toward improvements. Focuses on evaluating examples of both success and failure of different theories of change in specific global health <u>implementations.</u></p>
STRAMGT 306	Food, Health & Nutrition Entrepreneurship	X		<p>Americans spend nearly 7% of their income on food items and another 5% on food services annually (US Census). Food spend is at the intersection of two of the most important industries in the US: health care and agriculture. Food production today supports the food consumption causing our extraordinary burden of disease; 75 cents of every dollar of the \$4.8 billion spent annually on health care is for diet-related disease. The health care system accounts for over 17% of U.S. gross domestic product (GDP). Agriculture and agriculture-related industries contributed 4.8% to the U.S. gross domestic product (GDP) in 2012. This course focuses on the opportunities across these industries for food, health, and nutrition entrepreneurship. The course is designed for students with a broad interest in the food or health systems and/or who are interested in careers in food-related fields. We will examine the food system from three points of view: the consumer, nutritional science, and policy. The class will focus on problem-solving from the perspective of an entrepreneur. The class will involve lecture, discussion, and prominent guest speakers who are <u>entrepreneurs themselves or industry leaders.</u></p>

STRAMGT 350	Global Value Chain Strategies	X		This course addresses how the increasingly large number of firms that use or provide outsourcing and "offshoring" can create a sustainable competitive advantage. Students who complete the course will have a framework and a set of concepts that can be used to position a firm for strategic advantage in these supply networks. Positioning in and strategic analysis of product markets is covered in a variety of courses and books. A distinguishing feature of this course is that it addresses positioning and strategic analysis for firms operating as part of a network of providers, sellers and buyers... the factor markets. The course takes a general management perspective and provides examples through cases and discussions with visitors. The major theme of the course is that these firms must carefully consider how they position themselves in both the product and factor markets.
STRAMGT 519	Building Diverse and Inclusive Organizations	X		We will discuss effective strategies for building diverse and inclusive companies, and will address the barriers that can often exist. We'll study approaches to organizational design that limit unconscious bias and produce more objective decisions across the employee experience - from attracting and hiring candidates to developing and retaining employees. Finally, we'll look at how to create inclusive cultures, with a specific focus on feedback, belonging, and 'Radical Candor'. The class will be taught by Fern Mandelbaum, Co-Founder and Managing Partner at Vista Venture Partners and Joelle Emerson, Founder and CEO of Paradigm. We will also hear from executives at companies that have successfully incorporated diversity and inclusion programs.
STRAMGT 545	Taking Social Innovation to Scale	X		How do you get the best new social innovations to reach the hundreds of millions of people who need it the most? And how do ensure that they are developed, deployed and scaled in a way that is relevant, appropriate and sustainable?nnnnInnovators tackling the world's most difficult problems often ignore, misunderstand, and under-invest in the critical business challenges involved in crossing the middle of the value chain. This is innovation's valley of death: product and system adaption and evaluation; evidence generation and design validation; business and partnership planning; formal or informal regulatory approval and registration. How do you design, introduce, and optimize the intervention's uptake before it can be taken to scale by markets, governments or other systems? nnnThe class is taught by Steve Davis, President & CEO of PATH ( www.path.org), a leader in global health innovation, and former global Director of Social Innovation at McKinsey & Company.nnnWe take an inter-disciplinary approach to look at the factors that pull innovation forward, push it from behind, and (often to the world's detriment) block its successful implementation and scaling. First grounding the discussion in research on innovation and social change, we then apply business principles, real world experiences and several important case studies in global health to examine the way good ideas get stuck, and how good ideas can turn into innovation that matters. We focus on root causes for failure, success factors, and business practices and tools to enable millions of lives to be impacted by social innovation. The seminar combines lectures, case studies, visiting practitioners and team projects focused on the business case for scaling specific social innovations. The goal is to help the next generation of social innovation leaders think more about some of the mistakes of the past, lessons for the future, and new ways of approaching old problems, all from a practitioner's point of view.
STRAMGT 545	Biodesign Innovation: Needs Finding and Concept Creation (Same as BIOE 374A, MED 272A)	X		In this two-quarter course series ( BIOE 374A/B, MED 272A/B, ME 368A/B, OIT 384/5), multidisciplinary student teams identify real-world unmet healthcare needs, invent new medtech products to address them, and plan for their development into patient care. During the first quarter (winter 2017), students select and characterize an important unmet healthcare problem, validate it through primary interviews and secondary research, and then brainstorm and screen initial technology-based solutions. In the second quarter (spring 2017), teams select a lead solution and move it toward the market through prototyping, technical re-risking, strategies to address healthcare-specific requirements (regulation, reimbursement), and business planning. Final presentations in winter and spring are made to a panel of prominent medtech experts and investors. Class sessions include faculty-led instruction and case demonstrations, coaching sessions by industry specialists, expert guest lecturers, and interactive team meetings. Enrollment is by application only, and students are expected to participate in both quarters of the course. Visit <a href="http://biodesign.stanford.edu/programs/stanford-courses/biodesign-innovation.html">http://biodesign.stanford.edu/programs/stanford-courses/biodesign-innovation.html</a> to access the application, examples of past projects, and student testimonials. More information about Stanford Biodesign, which has led to the creation of more than 40 venture-backed healthcare companies and has helped hundreds of student launch health technology careers, can be found at <a href="http://biodesign.stanford.edu/">http://biodesign.stanford.edu/</a> .
STRAMGT 574	Strategic Thinking in Action - In Business and Beyond (II)	X		This six-session 2-point class seminar will involve students (maximum 20) in analyzing the emerging global electric automotive industry by focusing on: (1) The electric automotive industry in the U.S. and Europe, (2) the electric automotive industry in Japan and Korea, and (3) the electric automotive industry in China. We will each time examine the strategies of the key automotive companies as well as that of the government and other key players such as infrastructure providers. The purpose of the seminar is to help students sharpen their skills in identifying facilitating and impeding forces of strategic change, and in assessing and estimating the direction and rate of strategic change. While the instructors will provide relevant pre- readings related to these topics, students will be expected to complement these materials with their own research of theoretical and empirical sources. They will also be expected to help structure the discussion and move it forward toward conclusions. Students will organize into three teams each focused on one of the regions and prepare a five-to-ten page group report of their most important findings and conclusions that they present to the class.

STRAMGT 583	The Challenges in/with China	X		<p>The general objective of the course is to develop a solid grasp of the changing socio-economic and political situation in China (with its challenges both for China and for the rest of the world). It should make then possible to define sustainable strategies for managing effectively in China and for handling the growing interdependence between China and the US and China with the rest of the world. From assessing critically the performance of China today, students will get an insight in the current complex dynamics of China renaissance/transformation and discuss alternative scenarios, with their business and socio-political consequences on the medium term. From this analysis and with a prospective perspective in mind, we will explore alternative strategic business approaches and propose responsible management practices required to build, overtime, a mutually rewarding growing inter-dependence.</p> <p>More specifically, the course will initially identify the multi-causality behind China's achievements and discuss some of the dysfunctions associated, today, with such performance. The conditions of management effectiveness required to enter and succeed overtime in the Chinese market will be identified while the challenges faced by the global expansion of Chinese firms overseas will be illustrated.</p> <p>The course will rely upon different pedagogical methods; it will create conditions to share and leverage participants' experience and it will make use of a number of recent cases and research results.</p> <p>Auditors will be admitted, but they will have to be present (and prepared) in all the sessions.</p>
STRAMGT 584	Frontiers of Anaerobic Treatment (Same as CEE 179F)	X		<p>This seminar will present the latest findings on the operation and performance of ground-breaking anaerobic treatment processes for domestic wastewater. Specifically, this seminar will examine the performance of the Staged Anaerobic Fluidized-bed Membrane Bioreactor (SAF-MBR) using results from ongoing operations at the Codiga Resource Recoverer Center and from previous and parallel research efforts. The seminars will incorporate a description of the fundamentals of anaerobic treatment processes, a discussion of how the SAF-MBR process is different from typical anaerobic processes, and insights from operations along with implications for system design. Course work will include explorations of the costs, benefits, and market potential of this technology.</p>
STRAMGT 319	Strategic Philanthropy and Impact Investing	X		<p>The course will be structured around the perspective of a high net worth individual who has decided to devote substantial resources to philanthropy and wishes to decide which philanthropic goals to pursue and how best to achieve them. Although there are no formal prerequisites for the course, we will assume that students have experience working at a foundation, nonprofit organization, impact investing fund, or similar organization, or have taken an introductory course in strategic philanthropy such as GSBGEN 381. (There is sufficient overlap with Paul Brest's Autumn course, Measuring and Improving the Impact of Social Enterprises ( GSBGEN 322), that students taking that course should not enroll in this one.)</p> <p>We will explore selected topics including:</p> <ul style="list-style-type: none"> <li>- the roles of the philanthropic and nonprofit sectors in society;</li> <li>- choosing philanthropic goals, and whether giving to the poor is morally obligatory;</li> <li>- the justifications for tax-subsidized philanthropy;</li> <li>- alternative legal and organizational structures to carry out philanthropic programs, including donor-advised funds, direct giving, foundations;</li> <li>- whether foundations should exist in perpetuity or spend down over a finite number of years;</li> <li>- fundamentals of nonprofit strategy;</li> <li>- designing performance metrics (KPIs) and measuring philanthropic impact;</li> <li>- barriers to the practice of strategic philanthropy;</li> <li>- fundamentals of investment management for pools of philanthropic capital;</li> <li>- socially motivated criteria for investing, including PRIs, MRIs, SRIs, and negative screens;</li> <li>- impact investing and investor-funded nav for success programs.</li> </ul>
STS 1	The Public Life of Science and Technology	X		<p>The course focuses on key social, cultural, and values issues raised by contemporary scientific and technological developments through the STS interdisciplinary lens by developing and applying skills in three areas: (a) The historical analysis of contemporary global matters (e.g., spread of technologies; climate change response); (b) The bioethical reasoning around health issues (e.g., disease management; privacy rights); and (c) The sociological study of knowledge (e.g., intellectual property, science publishing). A discussion section is required and will be assigned the first week of class.</p>
STS 190	Issues in Technology and the Environment		X	<p>Humans have long shaped and reshaped the natural world with technologies. Once a menacing presence to conquer or an infinite reserve for resources, nature is now understood to require constant protection from damage and loss. This course will examine humanity's varied relationship with the environment, with a focus on the role of technology. Topics include: industrialization, modernism, nuclear technology, and biotechnology. Students will explore theoretical and methodological approaches in STS and conduct original research that addresses this human-nature-technology nexus.</p>
STS 200A	Food and Society: Politics, Culture and Technology	X		<p>This course will examine how politics, culture, and technology intersect in our food practices. Through a survey of academic, journalistic, and artistic works on food and eating, the course will explore a set of key analytical frameworks and conceptual tools in STS, such as the politics of technology, classification and identity, and nature/culture boundaries. The topics covered include: the industrialization of agriculture; technology and the modes of eating (e.g., the rise of restaurants); food taboos; globalization and local foodways; food and environmentalism; and new technologies in production (e.g., genetically modified food). Through food as a window, the course intends to achieve two broad intellectual goals. First, students will explore various theoretical and methodological approaches in STS. In particular, they will pay particular attention to the ways in which politics, culture, and technology intersect in food practices. Second, student will develop a set of basic skills and tools for their own critical thinking and empirical research, and design and conduct independent research on a topic related to food. First class attendance mandatory.</p> <p>STS majors must have Senior status to enroll in this Senior Capstone course.</p>

STS 200H	Ethics, Science, & Technology	X		Critical analysis of ethical issues raised by recent or emerging advances in science and engineering. Issues: privacy, intellectual property, design equity, the public interest, ethical responsibilities of technical practitioners, research ethics, and freedom of inquiry. Advances from fields such as IT, biotechnology, nanotechnology, neurotechnology, construction technology, and transport technology. Seminar limited to 25 senior STS majors. Prerequisite: a course in ethics or permission of the instructor.
STS 200L	Critique of Technology (Same as ILAC 235)	X		Informed citizens living in today's world, and especially in Silicon Valley, should be able to formulate their own articulate positions about the role of technology in culture. The course gives students the tools to do so. Against the trend towards the thoughtless celebration of all things technological, we will engage in critique in the two senses of the term: as careful study of the cultural implications of technology and as balanced, argumentative criticism. Can technology make life more meaningful, society more fair, people smarter, and the world smaller? We will pay special attention to the insights that literature, and other arts, can offer for reframing digital culture. Selections by Latin American fiction writers (Cortázar, Zambra), philosophers and thinkers (Heidegger and Beller), as well as recent popular works of social commentary, such as You are not a Gadget, The Shallows, 24/7, and Present Shock.
SYMSYS 115	Critique of Technology	X		What is the character of technology? How does technology reveal aspects of human nature and social practices? How does it shape human experience and values? We will survey the history of philosophy of technology -- from ancient and enlightenment ideas, to positivist and phenomenological conceptions -- to develop a deeper understanding of diverse technological worldviews. This will prepare us to consider contemporary questions about the "ethos" of technology. Specific questions will vary depending upon the interests of participants, but may include: ethical and existential challenges posed by artificial intelligence; responsible product design in the "attention economy"; industry regulation and policy issues for information privacy; and the like.
SYMSYS 271	Group Democracy	X		This seminar will explore theoretical, empirical, and practical approaches to groups that come together around a common purpose or interest. Emphasis is on democratically structured, non-hierarchical and non-institutional decision making, e.g. by grassroots activists, student, or neighborhood organizations. Parliamentary, consensus, and informal procedures. How do groups form? How do they deliberate and make decision? What are the principles underlying different models for group process, and how well do different procedures work in practice? How do culture and identity affect the working of a group? And how are social technologies used? Readings from different disciplines and perspectives. Course is limited to 20 students. Prerequisite: A course in social psychology, decision making or group sociology.
THINK 40	Sustainability Challenges and Transitions		X	What are the most critical sustainability challenges facing us in this century? How can natural and social sciences, humanities, and technology fields interact to contribute to their solution? How do we balance the needs and desires of current generations with the needs of future generations? The term sustainability seems to be everywhere. Businesses, cities, non-governmental organizations, individuals, and universities such as Stanford use the term to characterize decisions that make sense for the well-being of people as well as the environment. Beyond the popular use of the term is an emerging field of study that focuses on the goals of sustainable development - improving human well-being while preserving Earth's life support systems (air, water, climate, ecosystems) over the long run - and explores how science and technology can contribute to the solution of some of the most critical problems of the 21st Century. The goal of this course is to engage you in critical thinking and analysis about complex sustainability challenges and to encourage you to consider the need for integrative solutions that draw on different disciplines. We will examine some of the major problems of sustainable development (including issues related to food, water, and energy resources, climate change, and protection of ecosystem services), grapple with the complexities of problem solving in complex human-environment systems, and participate in the design of effective strategies and policies for meeting sustainability goals. You will learn to develop policy briefs addressing sustainability issues in the university, local communities, state and the nation as well as work on team projects with decision makers that address real-life challenges in your local area.
THINK 46	Why So Few? Gender Diversity and Leadership	X		Why there are so few women leaders and what is the cost to society for women's underrepresentation in positions of power? How can organizations and individuals increase women's leadership and be more inclusive of the diverse people that make up our society? Women make up half the population and have earned more than half of all the undergraduate degrees in the U.S. since the early 1980s; yet women comprise only 17% of US Congress, 4% of Fortune 500 CEOs, 16% of the board of directors of major corporations, 22% of tenured faculty at Stanford, and less than a fifth of law firm partners. For women of color, these numbers are considerably lower. Yet, research shows that gender diversity increases the creativity and innovation of groups. In this course, we will directly address the questions of why there are so few women leaders and what can be done, at an organizational and individual level, to increase their representation. Using the lens of sociology, we will think critically about leadership, influence, power, status, gender stereotypes, mentorship, and negotiation. Once we understand the mechanisms underpinning the lack of women leaders, we will discuss and critique potential interventions. A unique aspect of this course will be to apply some of the scholarly research on gender and leadership to our lives outside the classroom. We will be using modules based on those used in business schools and corporate executive training. Students will develop practical, real-world skills to increase their own leadership capacities by working on projects and taking part in interactive sessions on negotiation and team dynamics.

THINK 56	Justice and the Rationing of Medical Care	X		Is there a right to a basic level of health care? How should these resources be allocated? More globally, are there limits to how much should be spent on health care? If so, how should health care be distributed? One of the places where resource constraints are controversial and significant is in the field of health care, where lives literally hang in the balance of the decisions we make. In this course, we will develop the tools needed to begin to address these questions in a systematic way. Students will be introduced to general theoretical approaches to justice and ethics to provide a framework for evaluating particular topics. Most of the readings will refer back to these approaches as they are applied to particular issues. We will address justice and allocation issues at three different levels. First, we will discuss macro-level issues of health policy. This will include introducing students to basic concepts from health economics. What makes this course unique is that the bulk of the course will be applying these concepts at the institutional and bedside level. Class lectures will provide real world examples where these issues arise. Students will be asked to actively engage in the topics and to place themselves in the positions where these decisions have to be made.
THINK 57	What is Progressive about Progress?	X		What does it mean to be skeptical of the notion of progress? Where and when did we start believing in human progress and human perfectibility? Does progress imply that history has a particular direction? Is the idea of sustainability a viable alternative to the idea of progress? Much of our everyday thinking about politics, society, and even personal interactions depend on some concept of progress. This course challenges that basic assumption by engaging with thinkers who have cast the idea of progress into radical doubt. We ask where and when our modern idea of progress originated and why it has come to dominate Western thinking. The course engages with thinkers who argued in favor of progress as well as thinkers who attacked its presumptions. Reading and critically evaluating philosophical and literary texts, we will investigate the different consequences of our residual belief in progress, as well as the consequences of our abandonment of that belief.
URBANST 100A	Housing as a Human Right: Exploring Housing Justice from the Global to the Particular	X		Is it useful to conceptualize housing through a human rights lens? Are there ethical tools that we can use to think about housing that can work on a variety of different scales? This one-unit course aims to explore ideas about human rights as they intersect with ideas about housing. We will begin the class by examining philosophical ideas of what exactly are human rights and then move through different scales of context to discuss what housing as a human right can mean on international, national, regional, and particular levels. During the trip at the end of the quarter, students will be provided opportunities to apply the metrics and methods of thought used during the quarter to think about housing justice and ideas about housing as a human right in the Bay Area.
URBANST 104	Civic Dreams, Human Spaces: Urban Design with People	X		Intensive two-week studio explores the principles underlying vibrant public spaces. Use observation and prototyping tools to inform the process of urban development. Decode public spaces from multiple perspectives: as sites of recreation, interaction, and political contention; as physical infrastructure that municipalities or grassroots citizen groups build and maintain for the common good; and as places with intangible qualities, such as historical memory, identity, and personal stories. In addition to on-campus meetings, this course requires immersive fieldwork in the City of San Francisco, including two weekend overnight stays and the opportunity to re-imagine the design and use of public spaces with local partners. Enrollment by application only. Find more info and apply at dschool.stanford.edu
URBANST 107	Introduction to Urban and Regional Planning	X		An investigation into urban planning as a democratic practice for facilitating or mitigating change in society and the built environment. We will engage in professional planning practices in focused sessions on transportation, design, housing, environmental policy, demographic research, community organizing and real estate development. Strong emphasis on developing an understanding of the forces that shape urban and regional development, including cultural trends, real estate and labor economics, climate change and the environment, and political organizing and power dynamics
URBANST 110	Utopia and Reality: Introduction to Urban Studies	X		Designed for freshmen and sophomores. Introduction to the study of cities and urban civilization focusing on the utopias that have been produced over time to guide and inspire city-dwellers to improve and perfect their urban environments. History of urbanization and the urban planning theories inspired by Ebenezer Howard, Le Corbusier, Frank Lloyd Wright, the New Urbanists and Smart Growth advocates that address current issues such as urban community dynamics, suburbanization, sustainability, and globalization. Public policy approaches designed to address these issues and utopian visions of what cities could be, or should be, in the future. Topic of the final paper chosen by the student, with consent of instructor, and may be a historical research paper, a policy-advocacy paper, or a proposal for an urban utopia that addresses the challenges and possibilities of urban life today.
URBANST 111	Political Power in American Cities (Same as PUBLPOL 133, AMSTUD 121Z, POLISCI 121)	X		The major actors, institutions, processes, and policies of sub-state government in the U.S., emphasizing city general-purpose governments through a comparative examination of historical and contemporary politics. Issues related to federalism, representation, voting, race, poverty, housing, and finances.
URBANST 112	The Urban Underclass (Same as SOC 149, SOC 249)	X		Recent research and theory on the urban underclass, including evidence on the concentration of African Americans in urban ghettos, and the debate surrounding the causes of poverty in urban settings. Ethnic/racial conflict, residential segregation, and changes in the family structure of the urban poor.
URBANST 113	Introduction to Urban Design: Contemporary Urban Design in Theory and Practice	X		Comparative studies in neighborhood conservation, inner city regeneration, and growth policies for metropolitan regions. Lect-disc and research focusing on case studies from North America and abroad, team urban design projects. Two Saturday class workshops in San Francisco: 2nd and 4th Saturdays of the quarter.

URBANST 132	Concepts and Analytic Skills for the Social Sector	X		How to create and grow innovative not-for-profit organizations and for-profit enterprises which have the primary goal of solving social and environmental problems. Topics include organizational mission, strategy, communications/marketing, financing and impact evaluation. Opportunities and limits of methods from the for-profit sector to meet social goals. Perspectives from the field of social entrepreneurship, design thinking and social change. Focus is on integrating theory with practical applications. Enrollment limited to 20. Prerequisite: consent of instructor. Email: lalitvak@stanford.edu
URBANST 133	Social Entrepreneurship Collaboratory (Same as EARTHSYS 133)	X		Interdisciplinary student teams create and develop U.S. and international social entrepreneurship initiatives. Proposed initiatives may be new entities, or innovative projects, partnerships, and/or strategies impacting existing organizations and social issues in the U.S. and internationally. Focus is on each team's research and on planning documents to further project development. Project development varies with the quarter and the skill set of each team, but should include: issue and needs identification; market research; design and development of an innovative and feasible solution; and drafting of planning documents. In advanced cases, solicitation of funding and implementation of a pilot project
URBANST 155	Speed and Power: Travel and Travel Writing in the 20th Century (Same as HISTORY 237K, HISTORY 337K, FRENCH 237K)	X		Every story is in some ways a travel story, a journey from here to there. In this seminar we'll explore how different people in different times and places experimented with the travel-story form to make sense of their social worlds. We'll focus on the twentieth century, during which people, images, and ideas moved around the world at an unprecedented scale and with increasing speed. Some journeys take us across oceans, while others are limited to just a few city blocks. For a final project students may complete a standard research paper related to themes of the course, or may produce their own travel narrative, however they choose to interpret this rubric. nSPECIAL GUEST LECTURER: Pico Iyer, travel writer
URBANST 164	Sustainable Cities (Same as EARTHSYS 160)		X	Service-learning course that exposes students to sustainability concepts and urban planning as a tool for determining sustainable outcomes in the Bay Area. Focus will be on the relationship of land use and transportation planning to housing and employment patterns, mobility, public health, and social equity. Topics will include government initiatives to counteract urban sprawl and promote smart growth and livability, political realities of organizing and building coalitions around sustainability goals, and increasing opportunities for low-income and communities of color to achieve sustainability outcomes. Students will participate in team-based projects in collaboration with local community partners and take part in significant off-site fieldwork.
URBANST 170	Place-Making Policies (Same as POLISCI 220, PUBLPOL 225)	X		This reading and research seminar considers the numerous ways that governments conduct social policy by shaping and remaking geographic places. Representative topics include: housing aid programs, exclusionary zoning, controls on internal migration and place of residence, cars and their place in cities, and the politics of western water projects. Students will conduct original field research on the consequences of these policies for economic, social, and political outcomes.
URBANST 180Q	How to be Governed Otherwise: Art, Activism, and the City (Same as ARTSINST 180Q, CEE 131Q)	X		This course will introduce you to contemporary art's engagement with political activism. This introduction will focus on the city as, at once, a field and target of activism; a field of public appearance, artistic intervention, and political action, as well as a target of claims to residence, livelihood, recognition, justice, and collectivity. We will pose activist politics, artistic intervention, and urban space as mutually imbricated, each shaping the possibilities, programs, and histories of the other; a perspective that offers insights into the spatiality, materiality, and visuality of political identity, agency, and action. Over the quarter, we will study some of the many artistic interventions that are encompassed by urban activism, from informal and everyday practices to protest, resistance, and occupation. Comparative case studies will be drawn from a global context. You will investigate these case studies through both research on urban activism and activist practice; the seminar will therefore invite you to explore the militant possibilities of research, the research possibilities of activism, and the implications of each for the production of art.
URBANST 182	Activating Urban Spaces (Same as ARTSINST 182, CEE 131F)	X		This course will look at how public urban spaces are structured with a particular eye to the involvement of art and artists, whether formally or informally, in shaping the built and social environment of the city. Throughout the course particular focus will consider the possibilities for engaging social justice outcomes through spatial intervention drawing on examples from around the world. Interventions in urban spaces enact local change by making art the language of civic engagement; in this way a mural or performance or reconceptualized public space can become a method to address issues of locally prioritized inequality. We will use Stanford University and the Bay Area as our local research sites, making trips into the field to analyze methods, approaches, and experiences of urban spaces in action as well as bringing experts who work in related fields into the classroom. Sites of study include parks, public art, and street festivals by looking at arts organizations, city projects, community groups, and individual artists. The class will operate as a hybrid seminar and collaborative studio workspace which supports students in using ethnographic, visual, mapping, historical, and participatory methods in developing projects that respond to a particular site of their choosing.