

Course Number	Title	Level	Level of Sustainability	School/College	Description
ARCH 531	Networked Cities	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman)	This course examines architecture's emerging relationship with the design of interactivity, interfaces, and information infrastructures. Working mainly in seminar format, in response to short weekly readings, participants debate issues in the past, present, and future of technology-laden places. Biweekly lectures explore how places have generally emerged at crossovers between infrastructures. Biweekly storyboard projects interpret architecture and the city in terms of interaction design. A final project invites a situational design proposition. Emphasis is on how computing now pervades the physical world, however, and not on dematerialization. This course attempts to take apart popular misconceptions of cyberspace, and to reassess the value of embodied architecture in a digital economy.
ARCH 585	Adv Building Tech	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman)	Adv Building Tech
ARCH 589	Site Planning	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman)	The primary goal of this course is to introduce the student of architecture to landscape architecture, site engineering and design. The course is divided into two seven-week segments. The site-engineering segment introduces and develops an understanding of site grading skills, the reasons for grading, the effect of grades on water drainage and the use of storm drainage systems. The site planning segment introduces and develops an understanding of design synthesis by focusing on the constraints and opportunities provided by the landscape, as related to the shaping of architecture. Lectures and studio assignments emphasize the relationship between landscape architecture and architecture for the positive development of site and structure.
ARCH 519, UP 519	Theories of Urban Design	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman) Å» Urban and Regional Planning	The seminar is designed as a critical and collective inquiry into theories of urban design in order to develop an in-depth, interdisciplinary approach toward a more meaningful urban design for the future. Through a series of readings, discussions, case studies, presentations, and research work, students focus on deficiencies and opportunities in current urban design approaches, and formulate their own perspectives and strategies of urban form intervention, based on a critical understanding of the fundamental nature of cities versus the nature of thinking in the field of urban design.
ARCH 595, CEE 574	Materials Selection for Sustainable Design	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman), Engineering Å» Civil & Environmental Eng., Engineering	Integrated study of materials properties, performance, and economic and environmental cost, as related to engineering and architectural design. Topics include material properties and selection, materials database, processing and design, ecological considerations, and optimization. Examples will be drawn from cementitious materials and ceramics, metals, polymers and composites.
UP 520	Urban Land Use Planning	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This course will provide a broad overview of major land use planning issues from the perspective of the professional planner. Students will learn the fundamentals about the planning and development process including how to: review site plans, develop master plans, revise development standards, write staff reports and inspect development sites. Important planning tools and techniques will be applied to sustainable land use practices such as natural features protection, infill development, brownfield mitigation, neo-traditional development and urban waterfront redevelopment. Speakers and field trips will provide first hand glimpse of the major land use issues that planners deal with everyday. This course will be helpful to anyone interested in working as a public or private sector planner.
UP 521	The Social Life of Public Spaces	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This course examines the social life of parks, sidewalks, subways, plazas, malls, and other shared spaces. The course will focus on the aesthetic, legal, and social considerations that designers and city officials should consider when they try to use regulation and design to promote the health and vitality of public spaces. An eclectic array of classic and contemporary readings from sociology, urban planning and design, law, and related fields will be reviewed.
UP 522	State&Local Land Mgt	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	State and Local Land Management --- State government has always been the primary source of the legal authorities used for the public management of private land use and development. Most states have traditionally delegated many of those authorities to their local governments. Since the 1970's, however, - suburban sprawl- has increasingly prompted states either to take some of those authorities back or to demand more and better management by their local governments. This course explores the successes and failures of state-level attempts to reform local land use planning and development management efforts.
UP 523	Regional Planning	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This introductory course examines regional planning and analysis. Regionalism represents a distinctive view of metropolitan development, an alternative conception of community, and an institutional response to environment, economic and social challenges. We examine such debates as sustainability, metropolitan sprawl, city-suburb inequality, and the role of state and federal policy.
UP 524	Land Use Planning & Development Management	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	Land use is one of the essential dimensions of planning. While criticisms over past practices abound, land use planning remains a critical arena for discussion and innovation. Moreover, while many associate land use planning with development; it also plays a significant role in rethinking land management in cities with declining populations and correspondingly growing regions of vacant land. Understanding how different land use controls work and the reasons for their creation can help decode our existing landscapes and provide insight for further policy and design implementation. This course will provide students with an overview of the techniques, process, strategies, and potential tradeoffs of different land use planning approaches.
UP 537	Housing Policy and Economics	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	The objective of this class is to provide students with an understanding of policy and planning in housing, and the role of regulation in housing development, delivery, and choice. The course will address the economic, political, legal, and social forces that shape the house stock and its use by owner-occupiers and tenants. We will examine the policies and programs that are currently in place, and their effect on the quality and affordability of housing. The first part of the course will provide a broad conceptual understanding of the basic economics of housing supply and demand, including the economic and financial aspects of housing delivery, the legal and administrative framework in which housing is developed, and the way households make housing choices and adjust their housing consumptions. The second part of the class will focus on housing policy and planning to examine how affordable housing is delivered by both government and non-profit actors in the national, local, and community levels. The final part of the class will examine a variety of issues such as the links between housing and neighborhood transition, housing and transportation, and housing and local public finance.
UP 540	Planning Theory	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This is a course in the theoretical foundations of planning. This course will stress basic tools that will help you to invent new solutions to new problems in the real world. We will use case studies of urban regions across the US for class discussion to both bring theory to life and allow us to test established planning theory against real urban problems. We will cover the historical foundations of planning, the classical theoretical paradigms of planning, an examination of the major roles played by practicing planners, and finally the application of those theories and roles to the case study and to larger problems of environmental limits, economic globalization, and increasing social disparity.
UP 562	Regionally Significant Walkable Urban Places; Economic Role, Form and Management	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	Metropolitan development over the next generation will be focused around regionally significant, walkable urban places. Nowhere in the country are there more examples than the Washington, D.C. metropolitan area; twenty of these places are at critical mass, and ten more are emerging. There are five different types of walkable urban places, and examples of all five exist in the Washington region. This course will allow students to see, study and interview key players who are helping shape the development of these crucial places.
UP 564	Integrative Real Estate Seminar	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	A survey seminar regarding the various progressive approaches to real estate development, including downtown revitalization, conservation development, New Urbanism, etc. It will also review the history of conventional development, progressive project financing, and public policy such as smart growth and regionalism.
UP 574	Comp Urban Policy	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	The purpose of this course is to familiarize students with current debates dealing with urban planning theory and practice both domestically and internationally. The themes considered in the course include the built environment and architectural design of cities, modernist city-building and postmodern urbanism, the entrepreneurial city and privatized urbanism, and the politics of place.

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UP 614	Collaborative Planning	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban and Regional Planning, Arch. and U.P. (Taubman)	Conflict and disagreement are inevitable parts of the urban planning process. This course provides students the opportunity to learn skills and techniques of collaborative planning, the practice of engaging diverse people and groups to resolve disputes and come to agreements. Topics covered will include interest-based negotiation, stakeholder analysis, facilitation, mediation, the consensus building approach to multiparty negotiation, and the design of urban planning processes. Special attention will be paid to race, gender, and cultural diversity, as well as the role of power and expert knowledge. Students will explore these topics through in-class exercises and simulations, case analysis, readings, and discussion.
UP 650	Advanced Urban Theory	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban and Regional Planning, Arch. and U.P. (Taubman)	This is an intensive reading seminar on contemporary conceptual challenges in planning and urban development, with an emphasis on urban intellectual history and critical social theory. It is intended for both doctoral students and master's students interested in deepening their understanding of ideas in planning, urban theory, and urban history. Themes may include: the rise of the 20th Century planning thought in its broader social context; urban political economy; modernism and the failure of social engineering; postmodernism and the privatization of public space; suburbanization, regionalism and new urbanism; the impact of technological innovation on cities; networks and the information city; globalization and the persistence of the local; utopianism; and competing visions of the market and the state.
UP 656	Cnl City Pln&Com Dev	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban and Regional Planning, Arch. and U.P. (Taubman)	Central-City Planning and Community Development --- This course is designed to help students develop both theoretical and practical strength in understanding how to improve central cities. In addition to reviewing how central cities fit into the modern metropolitan context, we will focus on several approaches to improving central cities, such as comprehensive planning, growth management of containment, support for commercial areas, new urbanism as used in central cities, housing development, neighborhood rehabilitation strategies, and enhanced transit. The course will also explore the special role of community development corporations and citizen participation in creating improved central cities.
UP 658	Urban and Regional Planning in Developing Countries	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban and Regional Planning, Arch. and U.P. (Taubman)	Course designed to emphasize the theories that underlie planning interventions in countries that are newly industrialized or industrializing. Countries such as India, Jamaica, Malaysia, Guatemala, China, Thailand, Tanzania, Hong Kong, Venezuela, and Egypt, varying in size and historical antecedent, will be used for drawing illustrative case studies. The demographic, technological, and ideological changes that have resulted in unprecedented population growth and migration during the development decades will be reviewed. Responses to migration, housing scarcity, need for physical and social infrastructure, for jobs and amenities will be studied.
UP 671	Public Policy & Transportation	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban and Regional Planning, Arch. and U.P. (Taubman)	This course examines surface transportation from a broad public policy perspective, with a special focus on its institutional and urban components. With shifting political priorities, central government's role in transportation has changed significantly in the past decade. Concurrently, the mandates placed upon the transportation planning profession have changed and incorporate enhanced attention to air quality and other non-mobility concerns such as promoting broader public participation, preserving the environment, and ensuring social equity. The course investigates this changing landscape for transportation planning and its implications for the relationships between federal, state, regional, and local authorities.
UD 718	Theories and Methods in Urban Design	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban Design, Arch. and U.P. (Taubman)	This seminar explores contemporary theories of urbanism as a lens for understanding urban design practice. Cities are both participants in, and resultants of, systems of economy and power. As such, they evince design relationships between their public and the prevailing economic and political systems. Drawing from architecture, planning, urban design, cultural theory, geography, sociology, political science, and ecology, the course presents the interdisciplinary cross-section of theories of urbanization that will be used to examine the methods that have been and are being used to design cities today, globally.
UD 723	Methodologies of Urban Design	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban Design, Arch. and U.P. (Taubman)	Methodologies of Urban Design: Methodologies for understanding urban form and its meanings include formal analysis, historical analysis, demographic analysis, social analysis and ecological analysis. Methodologies for shaping urban form and their implications include grappling with multiple scales simultaneously, interacting with multiple and sometimes conflicting clients and constituencies, drawing upon both theory and empirical evidence and computer simulation.
UD 729	Practices of Urban Design	Graduate	Courses that include sustainability	Arch. and U.P. (Taubman) » Urban Design, Arch. and U.P. (Taubman)	Urban design is practiced in many different ways. Utilizing case studies and invited practitioners, this course exposes students to selected design and development processes, such as issues of real estate practice and law, issues of professional accountability and values, public policy, economic feasibility, influences of political and financial institutions, zoning and covenants, infrastructure, traffic engineering, phasing of development, environmental impact analysis and the regulatory system.
BA 612	Business Strategies for the Base of the Pyramid	Graduate	Courses that include sustainability	Business (Ross)	The condition of the world's poor is the subject of growing attention. Global poverty is increasingly seen as an unacceptable outcome of the current economic system, and there is interest in exploring new market-based approaches to poverty alleviation. The emerging base of the pyramid (BoP) perspective aligns business-oriented incentives for growth, innovation, and profits with the development community's efforts to create a more inclusive capitalism. In fact, the relationship between profits and poverty alleviation in pursuit of mutual value creation is a central component of the BoP perspective. To explore these issues, this course integrates concepts of strategy, international business, non-profit management, and poverty alleviation to stimulate the leadership skills and competitive imagination needed to design BoP ventures. Through combination of cases, readings, lectures, videos, and outside guests, class session will engage students in discussions aimed at: 1) identifying the opportunities associated with a new perspective on serving BoP markets; and 2) developing the strategies, business models, and partnerships required to productively explore those opportunities.
BE 550	Non-Market Strategy	Graduate	Courses that include sustainability	Business (Ross)	Non-Market Strategy --- This course examines influences on business that arise from public policies, government regulation, non-governmental organizations and media, which have come to be called the "non-market environment." The course examines how business is affected by these non-market institutions and actors, and how business can help shape the environment and the "rules of the game." The course stresses the interaction between market and non-market business strategies, and how firms operate the public arena to create and maintain competitive advantage. The course draws from the literature on economics and politics of government regulation of business, as well as from business case studies.
BL 557	Legal & Ethical Envt	Graduate	Courses that include sustainability	Business (Ross)	Legal and Ethical Environment of Business --- This course focuses on the role of law in positive leadership and organizational success. The course has two main goals: (1) to develop legally and ethically savvy leaders who are able to achieve career success by understanding the legal aspects of their business responsibilities and (2) to show how organizations can achieve competitive advantage by reducing legal risk and using the law to create economic value, while also encouraging responsible conduct. More specifically, the course offers an examination of legal and ethical issues that every businessperson should understand to make sound business decisions in a global environment. It provides an overview of the legal system, the nature and uses of law, ethical decision-making frameworks, contract law, torts and the law of product liability, criminal law, the regulatory environment, intellectual property, and employment law.
ES 520	CleanTech Venture Opportunities	Graduate	Courses that include sustainability	Business (Ross)	In 2006, CleanTech became the third-largest sector for venture investment (\$2.9 Bn), indicating the potential for economic growth in this technology innovation space. The growth in this area is primarily driven by investments in Energy, with lesser investment in Water, Transportation, Advanced Materials, Manufacturing and Agriculture. Clean technologies have the opportunity to deliver dramatic improvements in resource efficiency and productivity, creating more economic value with less energy and materials, or less waste and toxicity. CleanTech Entrepreneurship will focus on value creation in this space, with emphasis on how strategic business drivers (e.g. regulation, subsidy, and market valuation) influence innovation and investment, and how this may impact research hypotheses and needs. The perspective provides in this course will be valuable for students that are both looking to form or join startup companies as well as for those that are looking to create corporate value via industrial research.

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ES 644	Introduction to Microfinance	Graduate	Courses that include sustainability	Business (Ross)	<p> A live broadcast of a 7-week seminar speaker series hosted by the Haas School of Business University of California explores why and how microfinance operations have grown to provide financial services to poor and low-income people on a sustainable basis. The class brings together advice and best practices from successful practitioners and institutions around the world as well as new technology startups targeting the industry. This course will provide students with an excellent introduction to microfinance as an important development effort in the war against poverty, and it will also serve as an excellent forum to learn about current challenges and debates in the world of microfinance. This course represents a unique partnering with the Haas School of Business. A 2-hour webcast will be followed by an additional hour of discussion led by Ross faculty. </p>
LHC 506	Corporate Governance	Graduate	Courses that include sustainability	Business (Ross)	<p> Corporate Governance --- Every business activity is affected by the issues of corporate governance and social responsibility. This course will examine how modern corporations are governed and to whom they should be responsible. Students will learn to analyze issues concerning: </p> <ul style="list-style-type: none"> - The theory and purpose of the firm - The role of law - The role of the board of directors - Fiduciary obligations owed to the corporation and its shareholders - The role of shareholders and shareholder activism - Corporate responsibility to other constituencies including employees, customers, suppliers, and communities, etc. - Contests for corporate control - Effects of fraud and corruption - Prosecutorial discretion - Legislative reform - International comparisons of corporate governance structures - Governance of not for profits <p> The material in this course is taken directly from actual corporate conflicts. The struggles over control of the modern corporation evolve and present themselves in a myriad of forms. The issues underlying these struggles are still being resolved. This course seeks to alert future business actors to the powerful impact these issues will have on their ability to manage effectively. Further, students will be encouraged to develop and refine their views on how these issues should be resolved. </p>
MKT 614	Social Marketing	Graduate	Courses that include sustainability	Business (Ross)	<p> Explores social marketing and consumer culture from managerial and ethical perspectives. The overall thrust of the course will be on using marketing methods to benefit the public interest. Topics will include: social marketing such as anti-smoking campaigns; corporate social responsibility and cause related marketing; marketing in nonprofit organizations; green marketing; economic and sociological perspectives on consumer culture; the psychology of happiness and how personal well-being is influenced by wealth, consumption, and materialism; and public policy concerns related to marketing and advertising. </p>
EDUC 661	Hist of Postsec Educ	Graduate	Courses that include sustainability	Education	<p> History of Postsecondary Education: There are several lenses through which the history of education may be studied. This course will examine the history of American higher education as a story of growth and change accompanied by a persistent struggle for definition and identity. Over 350 years of higher education in the U.S., the system has evolved from a limited institution - one designed to train a small percentage of elite white men for the clergy and high political positions - to an enterprise which involves well over half the adult population of the country and countless citizens from other nations. This change happened gradually, often attended with fierce debate and controversy. In essence, the course will study the struggle of persons, institutional types, or ideas on the "margins" of the society to become part of the central fabric of higher education against the continuing dominance of elites. The class will explore these efforts by reading both primary documents as well as the work of historians and other scholars. More specifically, this class will analyze the shifting nature of the answers to five fundamental questions, which seek to define the goals, philosophy, and means of higher education. These questions are: who should be taught; what should be taught; how should institutions be governed; who should be served; and what is the role of higher education in the larger society? We will also examine the development of the major institutional types within higher education. This is a broad survey course, which will acquaint you with the significant events and themes of both "mainstream" higher education and those issues of importance to people and institutions historically considered on the "fringe". The aim of the course is to provide those of you who plan careers as policy makers and senior administrators in higher education with a basic foundation in order to understand the origin and evolution of critical policy issues in higher education that continue to be of importance today. </p>
ENGR 521	Clean Tech Entrepreneurship	Graduate	Courses that include sustainability	Engineering	<p> The course teaches the students how to screen venture opportunities in various cleantech domains. Venture assessments are approached through strategic, financial and market screens, and consider the impact of policy and regulatory constraints on the business opportunity. </p>
ESENG 599	Special Topics in Energy Systems Engineering	Graduate	Courses that include sustainability	Engineering	n/a
MFG 557, MECHENG 577	Materials in Design	Graduate	Courses that include sustainability	Engineering	<p> Use of Materials and their Selection in Design --- Material properties, including physical, mechanical, thermal, electrical, economic, corrosion and environmental properties. Interaction of function, shape, choice of materials, processing, economics and environmental impact in design. Methodology for materials selection and optimization, including performance indices, multiple constraints and multiple objectives, Introduction to analysis of environmental impact of materials selection. </p>
AEROSP 530	Gas-Turbine Propulsion	Graduate	Courses that include sustainability	Engineering A» Aerospace Engineering, Engineering	<p> Advanced analysis of turbojet engines: effect of altitude parameters an engine performance; off-design equilibrium running of a turbojet engine; dynamics of engine considered as a quasi-static system; fluid mechanics of a rotating axial blade row; centrifugal compressors; transonic flow problems. </p>
AEROSP 633	Advanced Combustion	Graduate	Courses that include sustainability	Engineering A» Aerospace Engineering, Engineering	<p> Advanced Combustion Thermodynamics of gas mixtures, chemical kinetics, conservation equations for multi-component reacting gas mixtures, deflagration and detonation waves. Nozzle flows and boundary layers with reaction and diffusion. </p>
AOSS 532	Radiative Transfer	Graduate	Courses that include sustainability	Engineering A» Atmospheric, Oceanic & Space Sciences, Engineering	<p> Physical processes, mathematical representation and numerical modeling of radiative transfer through atmospheres. Rayleigh and Mie scattering. Gaseous absorption and emission lines and line broadening. Numerical considerations and approximations. Applications include radiative energy balance and global climate, satellite remote sensing of atmospheres, and propagation through ionized media. </p>
AOSS 588	Regional Scale Climate	Graduate	Courses that include sustainability	Engineering A» Atmospheric, Oceanic & Space Sciences, Engineering	<p> Regional scale climate processes are introduced along with the tools needed for their analysis, including downscaling techniques. The course integrates lectures, assigned journal papers, and hands-on data analysis. In a course project, students will apply the analytical tools to a subject chosen by the student. </p>
AOSS 550, NAVARCH 550	Offshore Engineering I	Graduate	Courses that include sustainability	Engineering A» Atmospheric, Oceanic & Space Sciences, Engineering, Engineering A» Naval Arch. & Marine Eng.	<p> Offshore Engineering I --- Design and analysis requirements of offshore structures. Hydrodynamic loads on offshore platforms and slender bodies. Marine riser mechanics: dynamics and structural stability. Mooring dynamics: nonlinear stability and design. Vortex induced vibrations: analysis and model testing. Marine renewable energy. Hydrokinetic energy harnessing. </p>
AOSS 578, EHLTH 671	Air Pollution Chemistry	Graduate	Courses that include sustainability	Engineering A» Atmospheric, Oceanic & Space Sciences, Engineering, Public Health A» Environmental Health Sciences, Public Health	<p> This course is for "hands-on" chemical modeling of the clean or polluted troposphere. This course provides an introduction to gas phase and aqueous phase atmospheric reaction chemistry. It also provides hands-on experience with building, testing, and exercising large chemical reaction models. It is of particular value to students interested in atmospheric composition, biogeochemical cycles, atmospheric modeling, chemical transformations, chemical measurements, combustion, or chemical engineering. </p>

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BIOMEDE 588	Global Qual Syst	Graduate	Courses that include sustainability	Engineering Å» Biomedical Engineering, Engineering	Global Quality Systems and Regulatory Innovation --- This course is for scientists, engineers, and clinicians to understand and interpret various relevant global and regional quality systems for traditional and cutting edge global health technologies, solutions and their implementation. Speakers from academia, the FDA, and biomedical related industries will be invited to participate in teaching this course.
CEE 520	Hydrological Models	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Key elements of land-surface hydrology. Water in the atmosphere; dry adiabatic and pseudoadiabatic processes. Vapor turbulent transfer. Heat fluxes and surface energy budgets. Mass transfer and energy budget methods for estimating evapotranspiration. Soil physical properties; water flow in unsaturated soils; infiltration. Snow hydrology. Runoff generation. Probabilistic approaches to describing spatial variability.
CEE 521	Flow Open Channels	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Conservation laws for transient flow in open channels; shallow-water approximation; the method of characteristics; simple waves and hydraulic jumps; non-reflective boundary conditions; dam-break analysis; overland flow; prediction and mitigation of flood waves.
CEE 522	Sediment Transport	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Mechanics of sediment transport processes in Fluvial systems; initiation of motion; bed forms; resistance to flow; suspended sediment transport; bed load transport; cohesive sediments; geomorphology principles.
CEE 527	Coastal Hydraulics	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	General description of wave systems including spectral representation; solutions to oscillatory wave equation; wave breaking; harbor resonance; wave shoaling, refraction, and diffraction; wave forecasting; selection of design wave conditions; forces on coastal structures; shoreline erosion processes.
CEE 540	Advanced Soil Mechanics	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Deformation and strength of soils; total and effective stress; drained and undrained behavior. Constitutive description: elastic-plastic, hardening/softening, Cam clay model, critical states. Stress paths, and testing of soils. Modeling of reinforced soil: multi-component model and homogenization approach; fiber-reinforced soil. Theorems of limit analysis; applications in stability assessment.
CEE 544	Rock Mechanics	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Engineering properties and classification of rocks. Strength and deformability of intact and jointed rock; in situ stresses; lab and field test methods. Stereonets and structural geology. Rock slopes; stability and reinforcement. Foundations on rock.
CEE 546	Slopes, Dams & Retaining Structures	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Slope stability analyses, seepage through soils, settlements and horizontal movements in embankments, earthen embankment and dam design, landslide and embankment stabilization, earth pressures and retaining structure design.
CEE 547	Soil Engineering & Pavement Systems	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Soil Engineering & Pavement Systems- Soils engineering as applied to the design, construction and rehabilitation of pavement systems. The design, evaluation and rehabilitation of rigid, flexible and composite pavements.
CEE 548	Geotechnical Earthquake Engineering	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Ground motion attenuation relationships, seismic site response analysis, evaluation and modeling of dynamic soil properties, soil-structure interaction, evaluation and mitigation of soil liquefaction, seismic code provisions and practice, seismic earth pressures, slope stability and deformation analysis, safety of dams and embankments, performance of pile foundations, and additional current topics.
CEE 563	Air Qual Engr Fund	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Air Quality Engineering Fundamentals --- Fundamental engineering principles for preventing or reducing air pollutant emissions. Combustion modifications to prevent pollutant formation. Gas adsorption and absorption processes, including carbon capture and sequestration. Particle filtration processes. Emissions and control of metals and air toxics. Indoor air pollutants and their control. Selected case studies. Economics and cost estimation.
CEE 573	Data Analysis in CEE	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Data Analysis in Civil and Environmental Engineering -- Course topics address practical problems of analysis of manipulation and monitoring datasets in environmental sciences and engineering: hypothesis testing, uncertainty, linear, regressions, data of high dimension, and time domain and frequency domain analysis of series. Examples are drawn from the fields of environmental and civil engineering and surface and subsurface hydrology.
CEE 580	Physicochemical Processes in Environmental Engineering	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Physicochemical separated and transformation processes in natural and engineered environmental systems; process modeling; design of operations involving state and phase transformation; chemical oxidation, reduction, sorption, stripping, and exchange processes, membrane separations, particle aggregation and coagulation, sedimentation and filtration.
CEE 582	Environmental Microbiology	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Discussion of basic microbial metabolic processes, thermodynamics of growth and energy generation, and genetic and metabolic diversity. Emphasis is placed on the application of these concepts to biogeochemical cycling, subsurface microbiology, wastewater microbiology, pollutant degradation, and microbial ecology.
CEE 587, NRE 558	Water Resource Policy	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Consideration of policy processes associated with the development and utilization of water resources. Special attention is given to the history and development of policy related to water quality. Multi-objective planning is presented. Consideration of institutional problems associated with the implementation of water policy in the federal, state, regional, and local arenas.
CEE 590	Stream, Lake, and Estuary Analysis	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Development of mass balance equations for the characteristics and spatial and temporal distributions of contaminants in natural aquatic systems. Description of the role of biochemical kinetics and mass transfer processes on oxygen resources in streams, lakes, and estuaries. Demonstration of case studies and applied problems.
CEE 624	Restoration Fundamentals and Practice in Aquatic Systems	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	The topics to be covered in the lectures are Sediment transport, Fluid mechanics/bluff body flows - Hydraulics, Geomorphology, Dimensional analysis, Field measurement techniques - Particle Image Velocimetry, Acoustic Doppler Velocimetry, flow and wave gauges. Biological overview: fishes, macrobenthos, plants. Current restoration techniques in a variety of environments.
CEE 631	Construction Uncertainty	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Decision making under uncertainty involving big decisions, big outcomes, big money, multiple impacts (financial, engineering, system, environment), multiple decision makers, repercussions over space and time, exploration, value of information, attitude towards risk (risk aversion), and even ethics. CEE631 addresses all disciplines in CEE, from Infrastructure Systems to Environmental Engineering, and examines decisions from all areas of large CEE projects. Example applications are drawn from transportation, bridges, tunneling, water supply systems, environmental impacts, public policy making, etc.
CEE 682	Special Problems in Environmental Engineering	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Special problems designed to develop perspective and depth of comprehension in selected areas of sanitary, environmental or water resources engineering.
CEE 693	Environmental Molecular Biology	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Principles and techniques of molecular biology with an emphasis on genetic analysis of enzymatic systems capable of pollutant degradation: Genetic systems and gene probing in unusual prokaryotes: Use of molecular biological techniques for the enumeration and characterization of natural microbial communities: Biochemistry and kinetics of enzymatic systems. Lectures and laboratory.
CEE 921	Hydra & Hydro Eng Res	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Hydra & Hydro Eng Res\
CEE 581, EARTH 581	Aquatic Chemistry	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	This course provides an introduction to the principles of aquatic chemistry and reactions applicable to the analysis of the chemical composition of natural water and engineered water treatment systems. Four chemical reaction classes are covered: acid-base precipitation-dissolution complexation oxidation-reduction reactions Emphasis is placed on developing problem solving skills and includes the use of graphical, analytical (e.g., the Tableaux method), and computer solution (MINEQL+) techniques. Problems are selected from a host of environmentally relevant systems including the geochemistry of natural waters, water treatment, groundwater remediation, and fate of inorganic pollutants in natural aquatic systems. Lectures present aquatic chemical principles in the context of contemporary environmental issues including water quality, climate change, and pollution prevention and abatement.
CEE 586, NRE 557	Industrial Ecology	Graduate	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering, Nat. Res. and Environment	Analysis of material and energy flows in industrial and ecological systems to enhance eco-efficiency and sustainability in meeting human needs. Methods: life cycle assessment quantifies energy, wastes and emissions for materials production, manufacturing, product use, and recovery/disposition; life cycle design integrates environmental, performance, economic, and policy/regulatory objectives. This interdisciplinary course also includes a series of industrial/municipal site assessments (one-credit optional).

Course Number	Title	Level	Level of Sustainability	School/College	Description
MECHENG 566, AUTO 566	Modeling, Analysis, and Control of Hybrid Electric Vehicles	Graduate	Courses that include sustainability	Engineering Å» Mechanical Engineering, Engineering	Modeling, analysis and control of vehicles with electrified propulsion systems, including electric vehicles, hybrid vehicles, plug-in and fuel cell vehicles. Introduction of the concepts and terminology, the state-of-the-art development, energy conversion and storage options, modeling, analysis, system integration and basic principles of vehicle controls.
NERS 585	Trans Rad Materials	Graduate	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	Transportation of Radioactive Materials — Analysis of risks and consequences of routine transportation of radioactive materials and of transportation accidents involving these materials; history and review of regulations governing radioactive materials,
LAW 505	Chinese Law&Legal Institutions	Graduate	Courses that include sustainability	Law	Chinese Law and Legal Institutions The Chinese world has a rich legal and governance tradition, elaborated over more than 2000 years before the complex encounter with the modernizing "West" (and Meiji Japan) in the 19th century. That long tradition not only exercised definitive influence on other legal systems in East Asia, but continues to shape the PRC's reform-era struggle with "Legal Construction" started in the late 1970s, and democratizing Taiwan's own approach to rule of law in a nominally less authoritarian context. This course will explore major topics in Chinese-world law and legal institutions from the pre-imperial age (before 221 BCE) to the present day. Through selected readings of secondary materials and primary sources in English translation, students will become acquainted with the roots of China's specific legal and governance tradition and work towards an understanding of contemporary Chinese-world institutions, identified practices and supporting assumptions. Specifically, the course will elaborate: the philosophical traditions embodied in Chinese institutions throughout history; imperial establishments from 221 BCE to the middle 17th century; the legal order implemented during China's last imperial dynasty (1644-1911); the effects of China's encounter with a rapidly industrializing "West"; developments during the early Republican, Beiyang Government and then Guomindang single Party-ruled states (and the Communist Party's legal system in "soviets" established in the 1930s); and then the PRC's post-1949 Communist Revolution legal-political order implemented (or not) through the "Anti-Rightist Campaign", the "Great Leap Forward", the "Great Proletarian Cultural Revolution", the beginning of "Reform and Opening to the Outside World" and to the present day which finds the PRC and Taiwan thoroughly entangled with the global trade regime and equally globalized capital markets, the United Nations, public international law and multilateral institutions, and international human rights norms and commitments. Over the semester, the course will focus on specific aspects of legal and institutional development in the modern Chinese world, including criminal law and procedure, commercial and corporate law, the foreign direct investment regime, administrative and constitutional law, the protection of basic human rights, and the PRC's engagement with public international law. At the conclusion of the course, students should be well acquainted with the reality and feasibility of "rule of law" in a Chinese world-state, and the many ways in which the Chinese experience informs law and legal institution development outside of the PRC and Taiwan.
LAW 514	Race Law Stories	Graduate	Courses that include sustainability	Law	Race Law Stories examines the history of race and law through a critical and multi-layered approach to cases in U.S. legal history. Our central question will be one about the relationship of law to the construction of race and the production of inequality. We will read landmark cases such as Dred Scott v. Sandford and Plessy v. Ferguson. Through the perspectives of critical race theory and critical legal history, we will revisit these cases to understand the social and political contexts out of which they emerged, and the consequences of their outcomes for the parties and the communities from which the cases emanated. We will also move beyond well-studied cases to read new work in the field of law and history that takes us beyond the black-white paradigm to see how legal race-making has also shaped ideas about Latinos, Native Americans, and Asian Americans. Guest speakers will join us to share their work.
LAW 519	UN & Other International Organizations	Graduate	Courses that include sustainability	Law	International organizations play an increasingly wide-ranging and consequential role in creating, interpreting, and securing compliance with international obligations.Å This course will address the legal issues arising from the creation and operation of international organizations, as well as the concerns and challenges that the actions of such organizations present, both on the international plane and in national courts.Å Topics covered will include the United Nations Security Council's role in sanctions and peacekeeping, the dispute settlement procedures at the World Trade Organization, and "technocratic" regulation by the International Civil Aviation Organization.Å This course complements and does not overlap with courses and seminars such as International Human Rights and International Trade.
LAW 534	Energy Law: Regulation of Electricity	Graduate	Courses that include sustainability	Law	n/a
LAW 577	Business & Econ of Health Law	Graduate	Courses that include sustainability	Law	Business and Economics of Health Law This course will provide students with an in-depth understanding of the business and economics of health care. Students should complete this class with knowledge and understanding of the different business structures, regulations and payment mechanisms and issues that face the government, health care providers and consumers in America—especially in the era of national health care reform. The course will examine the means by which patients gain access to health care and through which sponsors of health coverage organize and compensate health care providers. The course may include discussion of the nature and organization of the medical practice, hospitals and other health care entities, including Accountable Care Organizations and other physician group practice models; the economics of health care financing, insuring and pricing; the costs of fraud and abuse and employment alternatives; standards and methods of regulation, accreditation, credentialing and licensing affecting the structure, liability and permitted functions of health care entities and participants in the medical practice; the physician-patient relationship; and current subjects of political and health care industry debates and legislation arising during the semester. A fundamental knowledge of basic economics will be helpful, but not a prerequisite. One of the assigned texts for the course will provide adequate background. (See the footnotes to the class schedule for specific prerequisites.)
LAW 628	Environmental Dispute Resolution	Graduate	Courses that include sustainability	Law	Environmental Dispute Resolution ("EDR") is designed to acquaint the student with the process of negotiating and mediating environmental disputes and to develop both the skills of negotiating as well as an understanding of what is necessary for a successful resolution of such disputes. EDR is different from most other negotiations because it typically involves multiple parties who have an interest in the outcome and because it requires the utilization of scientific information from which scientific predictions may be at least challenging or impossible to make. We will explore the complexities of EDR by discussing observations of leaders in the field, by studying actual negotiated and mediated cases and discussing why or why not these disputes were successfully resolved. By using the lessons learned from these cases as a framework, we will begin to negotiate environmental disputes arising from simulated fact patterns. We will discuss the effectiveness of negotiation techniques and address the nuances that arise from power imbalance and commonly occurring political implications. We will evaluate whether resolution by compromise necessarily achieves environmental justice and we will discuss ethical issues that arise in EDR negotiations. The course will conclude with a Term Paper based upon your role in preparing for and experience in negotiating a resolution of a case simulation.
LAW 634	Water Wars/Great Lakes	Graduate	Courses that include sustainability	Law	In this class, we will learn and experience national, state, and international natural resource law through the lens of this unique region. The public trust doctrine, water law, the Clean Water Act and other environmental laws, and even maritime law are all being simultaneously litigated and rewritten in this period of seismic shifts in Great Lakes law. The class will cover these and other topics through lectures by and discussions with the leaders in the Great Lakes region who right now are remaking Great Lakes law and policy.
LAW 640	Critical Race Theory	Graduate	Courses that include sustainability	Law	This course will examine key writings of scholars in Critical Race Theory (CRT), a recent intellectual movement with roots in both Critical Legal Studies (CLS) and civil rights scholarship. Topics covered will include anti-discrimination law, affirmative action, identity politics, the intersection of race, gender and class, and post-modern conceptions of race, among others. Course coverage will emphasize the early CRT articles that focus on foundational jurisprudential concepts. The course will also touch on recent theoretical off-shoots of CRT and critiques of CRT.

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LAW 695	International Trade Law	Graduate	Courses that include sustainability	Law	This course is a comprehensive introduction to the legal framework for U.S. and international regulation of international trade in goods. The course will include: a brief introduction to the economics of trade; an examination of the World Trade Organization (WTO), the General Agreement on Tariffs and Trade (GATT), and related instruments; and an analysis of U.S. laws providing relief from "unfairly" traded imports, including the antidumping and countervailing duty laws, and of other U.S. laws providing for the restriction of imports, such as the "escape clause."
LAW 761	Water Law	Graduate	Courses that include sustainability	Law	The course in Water Law examines in depth the laws and methods by which the use of water, both surface water and groundwater, is allocated in the United States. It is quintessentially a class about water quantity in which water quality plays a limiting role. The text for the class will be Legal Control of Water Resources by Joseph Sax, Barton Thompson, John Leshy, and Robert Abrams, 4th ed., 2006. Topics of study will include: riparianism, prior appropriation, the five distinct doctrines that states apply to groundwater use, public rights in water, allocation of waters of shared basins, and federal water rights, and international water management. In the examination of the law in each of those areas, themes that relate water law to larger issues of development and economic policy will be considered. Roughly two-thirds of the material will have more direct and immediate applicability to the Western, more arid part of the nation. Even so, the East is becoming ever more "water-constrained" and faces increasing need for laws that better allocate the water resource.
LAW 767	International Environmental Finance	Graduate	Courses that include sustainability	Law	This course will explore the increasingly important role of finance in responding to international environmental problems. Developing nations, particularly the largest and most rapidly growing such as China, India, and Brazil, have been unwilling to accept obligations to address global environmental problems without the promise of new financial resources. The amount and governance of financial resources has at times become the focus of negotiation ("show me the money") and an end itself, as opposed to primarily a means to promote an agreed end such as reducing emissions of greenhouse gases or protecting biodiversity. Finance has shaped new institutional arrangements like the Global Environment Facility and Green Climate Fund (GCF), with steadily greater expectations of resources -- \$100 billion a year by 2020, in the case of the GCF. In addition to claims for help with "incremental costs," developing nations have made claims for compensation or payment for "loss and damages." Other potential financial issues to be explored include the environmental role and responsibility of international financial institutions, particularly the World Bank; the impact of lending by banks for projects in developing nations outside direct international control -- mainly large development banks such as BNDES in Brazil and large international commercial banks; and whether the share of total global assets under management -- over \$75 trillion by one estimate -- can be redirected to support sustainable development.
LAW 791	Environmental Crimes	Graduate	Courses that include sustainability	Law	In the last two decades, federal prosecutors have brought more criminal cases against corporations for environmental crimes than for any other form of white collar crime, and criminal enforcement has become an integral part of pollution prevention efforts in the United States. This course considers the criminal provisions of federal environmental laws, including the Resource Conservation and Recovery Act, the Clean Water Act, and the Clean Air Act, and their application in selected precedent-setting prosecutions. We focus on the legal and policy issues raised by prosecution of corporations and their officers and employees, including the role of criminal enforcement in a complex statutory and regulatory scheme, the coordination of parallel criminal, civil, and administrative proceedings, and controversies surrounding the government's strategies, including obtaining corporate waiver of attorney-client privilege and work product doctrine. Although not required, students may find it helpful if they have already taken one of the introductory environmental law survey courses and/or criminal procedure.
LAW 791	Toxic Substances/Toxic Torts	Graduate	Courses that include sustainability	Law	In 1984, a Union Carbide plant in Bhopal, India accidentally released a chemical that caused the deaths of more than 2,800 people and injured tens of thousands. A year later, another accidental release at a Union Carbide plant in West Virginia sent 135 people to the hospital and provoked fears that a disaster such as Bhopal could occur in the United States. This course explores the problem of toxics: substances arguably necessary to our industrialized society with the potential to cause injury to human health and the environment. How should government manage the risk of these substances? And what is the role of common law in compensating those who are exposed? The course will be divided into two parts. First, we will discuss several different regulatory approaches taken to control toxics -- for example, outright bans, risk-benefit balancing, and warnings. Our primary focus will be on the federal regulatory regime governing production and use of such substances. Second, we will discuss toxic torts, the common law actions for injuries from exposure. Our discussion will focus on substantive law -- theories of liability, proof, and remedies -- as well as the difficulties encountered in expanding the traditional tort paradigm to encompass injuries that may have long latency periods and other causes. The introductory environmental law class would be helpful, but is not necessary.
LAW 825	Public Interest Advocacy	Graduate	Courses that include sustainability	Law	The seminar examines the uses of litigation to effectuate social change in conjunction with other methodologies such as grassroots organizing, public education and legislative lobbying. Students will undertake exercises designed to simulate actual case settings involving large scale social problems. Because there will be some overlap with the nature of coursework in the public interest litigation seminar, students should elect one course or the other. Recommended for 2L's and 3L's.
LAW 842	Environ Litg in Supreme Court	Graduate	Courses that include sustainability	Law	When Chief Justice Roberts and Justice Alito took their seats on the Supreme Court, environmentalists predicted that the newly configured Court would restrict--and possibly even eviscerate--environmental laws. The Roberts Court's first significant environmental decision in the combined cases of Rapanos v. United States and Carabell v. Army Corps of Engineers revealed sharp divisions among the Justices. The stakes rose when the Court chose to hear five environmental cases during the 2006-2007 term, and five more in the 2008-2009 term. Most recently, the composition of the Court changed yet again when Justice Sotomayor was sworn in on August 8, 2009. This seminar will closely examine five environmental cases decided by the Roberts Court during the last four years: Rapanos v. United States (wetlands), Environmental Defense v. Duke Energy Corp. (power plant emissions), Massachusetts v. EPA (global warming), Entergy v. Riverkeeper (cost-benefit analysis), and Burlington Northern v. United States (Superfund liability). For each case, materials will include the Circuit Court opinion, selected portions of the parties' briefs in the Supreme Court, the oral argument transcript, and the Court's final decision. Through careful study of these cases, we will seek to understand not only the legal import of the decisions but also the direction of the Court under Chief Justice Roberts.

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LAW 886	Impact of Human Rights on International Law	Graduate	Courses that include sustainability	Law	<p>The Impact of Human Rights on International Law</p> <p>The efforts to protect human rights by means of international law are no less than revolutionary. They have turned states' insides out in an almost literal sense: The ways in which states treat their own nationals used to be the very core of "domestic jurisdiction" in which no foreign state or international organization was allowed to intervene. But over the last 50 years or so the relationship between governments and the people under their authority has turned into a subject of international (also: legal) concern, ranging from laying down human rights obligations in treaties, the discussion of human rights matters in international bodies and conferences, public censure and condemnation, the international "mobilization of shame", to judgments of human rights courts and sanctions against persistent violators. This development has had a profound impact not only on international politics but also on general international law - a body of principles, rules and procedures traditionally developed to cope with tasks and challenges arising at the level of inter-state (inter-sovereign) relations.</p> <p>The Seminar will analyze in depth the ways in which this development has manifested itself - and the difficulties to which it has led - in the most important fields of international law: international legal personality, the sources of international law, the law of treaties, state responsibility, jurisdictional immunities of states, the use of force, and the activities of international courts and tribunals.</p> <p>The Seminar will be offered for two credits, with an option of one additional credit point to be acquired by students enrolling in the #800 Seminar Supplement course and writing a more comprehensive paper.</p> <p>Participants must have attended at least one of the following three courses: 606 Transnational Law; 689 Leading Cases in International Law; or 605 Advanced Transnational Law.</p>
LAW 894	Good Life/Government	Graduate	Courses that include sustainability	Law	What Makes a Good Life? and What Should Government Do About It?
LAW 930	Environmental Law Clinic	Graduate	Courses that include sustainability	Law	The clinic offers hands-on lawyering experience in cases drawn from the judicial, administrative, and legislative docket of the National Wildlife Federation's Great Lakes Natural Resource Center in Ann Arbor. The Center's resident attorneys supervise students. Students work on a wide range of natural resources and conservation issues, and participate in some of the most significant environmental legal work in the United States. Students may visit officials, draft testimony on proposed legislation, write an appellate brief, participate in rule-making, or help negotiate a settlement. The clinic is a three-credit-hour offering that students may elect for one or two semesters, for a maximum of six hours. Courses in administrative and environmental law are not prerequisites, but are recommended.
LAW 796, PUBPOL 594	Thinking Analytically for Policy and Decisions	Graduate	Courses that include sustainability	Law, Public Policy (Ford)	The course will develop the skills of using analytic methods and models to understand real decisions and policy issues, drawn from the realms of natural resource management, public policy, business strategy, politics, negotiations, and conflict. The course will consider a variety of analytic techniques, methods, and models, particularly those emphasizing uncertainty and strategic interactions in decision making. Some elementary concepts of modeling will also be introduced, with emphasis on dynamics, uncertainty, and optimal choice under constraints.
AMCULT 614	Asian American History	Graduate	Courses that include sustainability	Literature, Science, & Arts » American Culture, Literature, Science, & Arts	Asian American History --- Through extensive readings in Asian American history, this course will survey scholarship dating from the origins of ethnic studies in the 1960's to the present. Discussions will focus on the following questions: How does the study of Asian Americans challenge historians to rethink issues of race, class, and gender? Why and how did the original vision of Asian American Studies emphasize social history and community studies? What have Asian American historians learned from interdisciplinary approaches? How have literary theory and cultural studies influenced recent and current work? What is the future direction of the field? "
ANTHRCUL 548	Theory & Practice in Medical Anthropology	Graduate	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	This seminar examines the theoretical foundations of medical anthropology as well as particular studies which represent subfield interests in cultural concepts of health and illness; local and global aspects of reproduction health; the social construction of knowledge and politics of science; ethno-medicine and healing; and perceptions of environment and health.
ANTHRCUL 673	Language Ideologies	Graduate	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	» "Language Ideologies" are conceptualizations about the language, speakers, and discourse practices people encounter in their social world. The study of language ideologies draws together questions about language, culture, social positioning, and politics. This course explores such questions theoretically and through a wide range of ethnographic, historical, and linguistic case materials.
ANTHRCUL 750	Curr Dev Anth Theory	Graduate	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Current Developments in Anthropological Theory --- A seminar class on a topic related to the current scholarly research of the instructor.
APPPHYS 639, MECHENG 539	Heat Transfer Physics	Graduate	Courses that include sustainability	Literature, Science, & Arts » Applied Physics, Literature, Science, & Arts, Engineering » Mechanical Engineering, Engineering	Heat Transfer Physics --- This course combines fundamentals of statistical thermodynamics, quantum mechanics, transport theories, computational molecular dynamics, solid-state physics, and radiation transport, as related to heat transfer and thermal energy conversion. It presents a unified theory of heat transfer physics in its modern applications.
COMM 834	Public Opinion	Graduate	Courses that include sustainability	Literature, Science, & Arts » Communication Studies, Literature, Science, & Arts	<p>Public Opinion --- In this seminar, we will study the nature and origins of public opinion and its representation through the media. Beyond developing an understanding of what public opinion is and the role it plays in a democracy, we will also look at the representation of public opinion in the media, the collection of public opinion data by and for the media, and the role that the media play in representing the state of public opinion to their audience members. This will include the linkage between elite and mass opinion, and the influence of public opinion on policy making.</p> <p>All of this will take place in the context of understanding the quality of the measurement of public opinion and the accuracy of its representation in the media. The focus will be on the use of polls and surveys to measure public opinion, although other techniques will be briefly considered. We will use the case studies of pre-election and exit polls to consider how information about public opinion is collected and disseminated and what the impact of alternative representations in news stories might be.</p>
CMPLXSYS 510	Introduction to Adaptive Systems	Graduate	Courses that include sustainability	Literature, Science, & Arts » Complex Systems, Literature, Science, & Arts, Literature, Science, & Arts » Mathematics	Introduction to Adaptive Systems
EARTH 504	Sources & Cycling	Graduate	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Sources and Cycling of Inorganic Nutrients and Pollutants --- This course will explore the chemical, physical, and biological processes that result in the release, transport, and fate of inorganic nutrients and pollutants in the environment.
EARTH 523	Microbial Community Omics	Graduate	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course will focus on emerging "omics" approaches (genomics, transcriptomics, proteomics) to studying microorganisms and their interactions with various environments. It will cover both conceptual and analytical aspects of microbial genome science through lecture and laboratory exercises. Lab exercises will focus on utilization of high-performance computing to analyze real datasets.
EARTH 532	Sem in Climate, Tectonics & Surface Processes	Graduate	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This seminar discusses the coupling and interactions between climate, tectonics, and Earth surface processes. This interdisciplinary seminar integrates concepts and readings from the fields of paleoclimate, neotectonics, tectonic geomorphology, lithospheric geodynamics, and process geomorphology. Emphasis is placed on learning how to critically analyze various methods, data sets, and arguments presented in the literature. Participants are expected to read and actively discuss current scientific papers.
EARTH 535	Seminar in Mineralogy, Petrology, or Geochemistry	Graduate	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Seminar in Mineralogy, Petrology, or Geochemistry Thermodynamic and transport properties of silicate liquids (density, compressibility, heat capacity, viscosity)
EARTH 929	Investigations	Graduate	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Investigations in Geology and Mineralogy

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EEB 556	Field Botany of Northern Michigan	Graduate	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	*BIOSTATION* This course offers a comprehensive field approach to vascular plants of the region, including characteristic species of terrestrial and wetland habitats as well as species known for their rarity or distinctive distribution patterns. Topics covered include the major plant families of the Great Lakes area, basic terminology and techniques useful in plant identification, the general phytogeography and ecology of the region especially as these relate to recent geological history of the landscape, and field recognition of over 300 selected species. Prior familiarity with at least some families and species will be extremely helpful.
ECON 662, NRE 669	Environmental Economics	Graduate	Courses that include sustainability	Literature, Science, & Arts » Economics, Literature, Science, & Arts, Nat. Res. and Environment	Environmental Economics
PHIL 576	Top in Soc Pol Phil	Graduate	Courses that include sustainability	Literature, Science, & Arts » Philosophy, Literature, Science, & Arts	Topics in Social-Political Philosophy
PSYCH 773	Eval Soc Prg	Graduate	Courses that include sustainability	Literature, Science, & Arts » Psychology, Literature, Science, & Arts	Research Methods for Evaluating Social Programs and Human Service Organizations --- This course focuses on the theoretical and strategic issues in designing and implementing formative or summative evaluations. The scope will include methods of evaluation appropriate for the study of social programs, human service organizations, inter-organizational relationships; and similarities and differences from methods used for basic knowledge development. The analysis of alternative evaluation models, procedures, and techniques and issues in the design, implementation, and utilization of evaluation research will also be addressed. Topics may include: the sociopolitical context; ethical issues; and planning of evaluations; specification of variables, with emphasis on definitions of effectiveness and on operations of service technologies; the formulation of evaluation objectives; issues in sampling procedures, measurement, and data collection; alternative models for designing programmatic and organizational evaluations, including networks analysis of findings; feedback at different stages of program evaluation; and reporting, dissemination, and utilization of results.
SOC 547	Gender & Sexuality	Graduate	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	Gender and Sexuality
SOC 555	Culture & Knowledge	Graduate	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	Culture and Knowledge
WOMENSTD 606	Refugees of a World on Fire: Women of Color and Transnational Feminisms	Graduate	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	This is a course in critical ethnographic research. It draws upon critical Feminist, Ethnic Studies, Cultural Studies, Post-colonial theoretical approaches. It will be divided into two parts. In Part One, we will study critiques that have scrutinized the relations of power underpinning conventional ethnographic methods. This overview will interrogate concepts such as "the field," "the community," or "culture" that are often taken for granted in traditional humanities and social science research. We will explore the politics of representation; relationships between ethnography, literature, media, and performance; ethnographic accountability to peoples' struggles for self-representation and self-determination; ethnographic betrayal and refusal; and how colonialism, imperialism, race, class, gender, and sexuality shape relations between researcher and subject. We will explore critical methodological alternatives that rely on concepts of locality, performativity, discourse, subjectivity, and articulation and the study of fields of power that are local and global in scope. In Part Two, we will explore methods relevant to students' research interests. Students will be required to develop methodological approaches related to their current research agendas.
NRE 501	Science & Management of the Great Lakes	Graduate	Courses that include sustainability	Nat. Res. and Environment	Grad Experimental course
NRE 509	Ecology: Science of Context and Interaction	Graduate	Courses that include sustainability	Nat. Res. and Environment	The natural science core course provides a broad foundational treatment of concepts and processes that operate in ecological systems. It covers interactions among water, soils, the atmosphere, and basic life processes (respiration and photosynthesis) in terrestrial and aquatic ecosystems, including the principles of energy flow and the cycling of matter. It covers ecological principles such as population growth and regulation, trophic interactions, ecological networks, and community change. It covers evolution and natural selection. The course draws examples from some of the dominant habitats on earth, including rivers, lakes, wetlands, forests, deserts, and agricultural systems.
NRE 510	Environmental Decision Making and Governance	Graduate	Courses that include sustainability	Nat. Res. and Environment	Focuses on the social, political and economic processes that shape human interactions with natural systems, that create environmental problems, and that resolve or manage those problems. The course draws broadly on research and scholarship from economics, ethics, political science, policy analysis, history, psychology, sociology, anthropology, management, and law.
NRE 516	Aquatic Entomology	Graduate	Courses that include sustainability	Nat. Res. and Environment	Aquatic Entomology
NRE 520	Fluvial Ecosystems	Graduate	Courses that include sustainability	Nat. Res. and Environment	This course introduces key concepts pertinent to understanding rivers and stream ecosystems and their management in the face of multiple human stressors acting at local through landscape scales. Physical, chemical and biological aspects are integrated into a holistic understanding of the processes that maintain the variety and variability of fluvial ecosystems. Using the watershed as a framework, the impacts of human activities are described and possible management and restoration actions are explored. Management issues including threats to river health, evaluation methods, management and restoration are covered in depth. Appropriate both for students interested in conducting research in fluvial ecosystems and for those interested in management of rivers and their watersheds. Need not be taken concurrently with NRE 521.
NRE 523	Ecol Risk Assessment	Graduate	Courses that include sustainability	Nat. Res. and Environment	Ecological Risk Assessment --- This course will introduce the environmental/ecological risk assessment (ERA) paradigm and describe in detail the process recommended by the U.S. Environmental Protection Agency (EPA). In addition, critical deficiencies that are often made when conducting ERAs will be identified, such as failure to adequately characterize spatial and temporal dynamics of exposure and subsequent linkages to adverse biological effects. Case study examples ERAs will demonstrate the state-of-the-art and new approaches that are decreasing the uncertainty associated with the ERA process. The important linkage of ERA issues to the decision-making, risk management process will be emphasized.
NRE 532	Natural Resource Conflict Management	Graduate	Courses that include sustainability	Nat. Res. and Environment	This course builds an understanding of the causes, dynamics and consequences of natural resource and environmental conflicts as well as the range of possible procedural interventions that can be used to manage these conflicts. The course emphasizes the practical application of dispute resolution theories to the environmental and natural resource context. Case materials for the course are drawn from current conflicts in situations including public lands management, air and water pollution regulation, solid and hazardous waste facility siting, wildlife and endangered species management, and community planning.
NRE 534	GIS & Landscape Mod	Graduate	Courses that include sustainability	Nat. Res. and Environment	The goal of this class is to explore various approaches to modeling landscape pattern and change. The course will necessarily move between social and ecological processes and applications of the models, always with a geographical focus. During the course we will read about different modeling approaches, discuss applications of models and work on 5-6 exercises. We will explore GIS suitability models through a number of statistical and computational approaches.
NRE 536	Environmental Mediation	Graduate	Courses that include sustainability	Nat. Res. and Environment	Module on Environmental Mediation --- This course is an intensive 20-hour module that develops a student's skills in mediation as they can be applied to the resolution of environmental and other public disputes. It will help a student to: assess the appropriateness of a mediation strategy; understand the group dynamics and incentives that make mediation challenging; design a negotiation process for multiparty disputes; carry out a mediation strategy both at the negotiating table and between meetings; and deal with difficult mediation challenges that occur in process design and management.
NRE 538	Natural Resources Statistics	Graduate	Courses that include sustainability	Nat. Res. and Environment	Basic concepts of biometrics and its application to natural resource problems solving to include descriptive statistics, probability, underlying distributions, sampling distributions, estimation, hypothesis testing, goodness-of-fit procedures, contingency tables, sampling, simple linear correlation and regression, one-way analysis of variance, and nonparametric statistics.

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NRE 540	GIS and Natural Resource Applications	Graduate	Courses that include sustainability	Nat. Res. and Environment	This course is intended to give students the ability to plan, design, and execute a GIS project for natural resources management. Students will learn the potentials and limitations of geographic analyses. They will learn how to build geographic databases, analyze data spatially, and produce output that succinctly summarizes their results.
NRE 541	Remote Sensing of Environment	Graduate	Courses that include sustainability	Nat. Res. and Environment	Remote sensing, including air photos and satellite imagery is one of the most useful and important spatial data sources in both GIS and environmental sciences defined broadly. In this course, students will learn the theory, sensors, analysis methods, and applications of remote sensing. Lectures provide a comprehensive introduction to remote sensing, and labs present opportunity for hands-on analysis experience using ERDAS Imagine and ArcGIS software and imagery.
NRE 553	Diverse Farming Sys	Graduate	Courses that include sustainability	Nat. Res. and Environment	Diverse Farming Systems: Theory and Practice
NRE 553	Diverse Farming Sys	Graduate	Courses that include sustainability	Nat. Res. and Environment	Diverse Farming Systems: Theory and Practice
NRE 555	Climate and Development: Impacts, Mitigation and Adaptation in Less Developed Countries	Graduate	Courses that include sustainability	Nat. Res. and Environment	Broadly understood, scholarship on climate change and development remains in its infancy. Whereas there has been an extensive attention paid to both issues through the years, only recently they have come together both as a field of inquiry and practice. Historically development policies emphasized centrally sponsored programs of change and large-scale projects to foment economic growth. Scholarship in the human dimensions of climate change have mostly focused on anthropogenic drives and mitigation and only more recently has started to explore impacts and adaptation more seriously. This class seeks to bring these two themes together by focusing on how development and climate change intersect both in policy design and implementation as well as a new focus of research and production of knowledge. The course is organized around themes interspersing climate change and development. Part 1 is a historical look on development theory and practice and the emergence of climate change as a critical stressor to be taken into account for future policy making. Part 2 focuses on potential impacts of climate change in less developed countries. Part 3 explores response options with an emphasis on adaptation, resource management, to the emergence of global institutions for environmental governance.
NRE 561	Psychology of Environmental Stewardship	Graduate	Courses that include sustainability	Nat. Res. and Environment	Conservation Behavior: The Psychology of Stewardship
NRE 562	Environmental Policy, Politics & Organizations	Graduate	Courses that include sustainability	Nat. Res. and Environment	Examines processes of resource policy formation and administration, and the behavior of government institutions as they shape natural resource policies and management programs. Develops an analytic ability to disaggregate complex political and management situations, assess the feasibility of resource policy changes, and build strategy to get such changes adopted and implemented. Cases explore situations at the federal, state, and local levels.
NRE 570	Microeconomics With Natural Resource Applications	Graduate	Courses that include sustainability	Nat. Res. and Environment	Develops the tools of microeconomics at an intermediate level. Supplementary materials highlight relevance of course concepts to natural resource and environmental issues. Emphasis is on skill development for natural resource policy analysis. Applications include oil cartels, forestry, common property fisheries, valuation of recreational sites, irreversible development projects, and below-cost timber sales.
NRE 580	Environmental Integrated Assessment	Graduate	Courses that include sustainability	Nat. Res. and Environment	This course provides students with a set of frameworks for integrating knowledge from natural and social sciences in support of environmental management and policy development. Through lectures, case studies, and discussions, students will learn how these frameworks are used to guide, implement, and analyze environmental policies. The course is designed as interdisciplinary and while it will include information at moderate depth in the areas of the case studies-the focus is on how disciplinary information is integrated for policy contexts.
NRE 586	Visualizing the Environment	Graduate	Courses that include sustainability	Nat. Res. and Environment	The objectives of this course are to understand the various 2-dimensional communication techniques used to represent 3-dimensional design ideas and the development of heightened visual perception related to representing the natural and built environment on paper.
NRE 587	Landscape as Environmental Media	Graduate	Courses that include sustainability	Nat. Res. and Environment	Provides 1st year students with a strong foundation in design fundamentals: strategies for spatial layout, form generation, appropriate media representation and translation of concepts into three-dimensional space. The second half of the term focuses on design process and the creation of landscape interventions in response to cultural and ecological context.
NRE 590	Landscape Ecology Design	Graduate	Courses that include sustainability	Nat. Res. and Environment	This course draws from landscape ecology, conservation biology, and aesthetics to design supportive environments for human experience and to protect habitats for other species.
NRE 661	Conservation Behavior Seminar	Graduate	Courses that include sustainability	Nat. Res. and Environment	Conservation Behavior Seminar
NRE 662	Advanced Seminar in Resource Policy	Graduate	Courses that include sustainability	Nat. Res. and Environment	Provides an opportunity for advanced resource policy graduate students to discuss and analyze current topics and normative in the field. The course content will change annually to reflect new ideas and issues in resource policy and administration, and because two-thirds of the seminar sessions involve discussion of student prepared papers, the exact content of the course will vary from year to year.
NRE 691	Plants and their Use in the Designed Landscape	Graduate	Courses that include sustainability	Nat. Res. and Environment	This course will focus on the art and science of using plants in the landscape. Building on previous knowledge from NRE 437, Woody Plants, this course will expand the plant palette of ornamental plants and focus on the cultural and design issues of using plants in the landscape.
NRE 787	Met Studio	Graduate	Courses that include sustainability	Nat. Res. and Environment	Metropolitan Studio This landscape architecture studio focuses on master planning and design for park and recreation areas, using a combination of formats-lecture, readings, and studio work.
NRE 841	PhD Res Forum	Graduate	Courses that include sustainability	Nat. Res. and Environment	PhD Research Forum Provide forum for progressing on dissertation proposal and research as well as fostering community among doctoral students, especially in the Resource Policy and Behavior and Landscape Architecture concentrations.
NRE 581, EDUC 581	Advanced Environmental Education	Graduate	Courses that include sustainability	Nat. Res. and Environment, Education	The goal of this course is to provide graduate students from variety of backgrounds (e.g. education, environmental science / studies, natural resource management, other) with the knowledge and skills to lead and manage environmental education programs. To achieve this goal, students will learn about theories, methods, and resources for effective environmental education as well as gain essential grant writing and program evaluation skills. After completion of this course, students will be able to: -- develop, implement, and evaluate environmental education programs, -- use instructional methods appropriate for environmental education, -- write a competitive environmental education grant proposal, and -- identify leading environmental education organizations and resources. As part of this course, students also have the option to become certified in Project Learning Tree, Project Wet or Project WILD, three of the most frequently used environmental education curricula in the country.
PUBHLTH 554	Introduction to Globalization and Health	Graduate	Courses that include sustainability	Public Health	The course addresses the diverse health impacts of economic, environmental, and cultural globalization. Well-being is affected by the transnational movement of people, technologies, capital, commodities, toxins, pathogens, ideologies and treatments, and changing global power relations and actions of international organizations. These topics are explored through lectures and discussion of readings.
PUBHLTH 610	Introduction to Public Health	Graduate	Courses that include sustainability	Public Health	This course is intended to serve as an introduction to the major issues of public health in the United States, although issues of global health will be considered as well. We will examine environmental, social and ethic determinants of public health, and how they may be altered.
EHS 500	Principles of Environmental Health Sciences	Graduate	Courses that include sustainability	Public Health & Environmental Health Sciences, Public Health	This course provides a broad overview of some of the most important and current challenges to human health from environmental and occupational risk factors while teaching the basic knowledge the basic knowledge and multi-disciplinary skills used to assess, control, and prevent them. We will address specific threats, such as outdoor and indoor air pollution, toxic metals, pesticides, radiation and occupational stressors; analyze impacts on specific diseases and injuries, such as cardiovascular disease, asthma, cancer, musculoskeletal injuries and impaired child development; and introduce emerging threats, such as the hormone-mimicking potential of plastic chemicals and the impact of global climate change on heat-related mortality and shifting patterns of infectious disease. Emphasis will also be given to understanding the worsening environmental health impacts of industrialization on developing countries, the effects of globalization, such as the growing movement of hazardous industries, products, and wastes across borders, and the rise of the environmental justice movement.

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EHS 501	Occupational Environmental Disease	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Selected topics in the diagnosis, treatment and prevention of environmental and occupational disease, including coverage of toxins, exposures, organ systems, and disease. Lectures and case studies address exposures to solvents, radon, lead and other metals, asbestos and other pneumoconiotic dusts, outdoor air pollution, indoor air quality, and noise. Major health effects and disease categories covered include cancer, respiratory disease, and reproductive health.
EHS 502	Developing Areas	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	The course provides a review of basic environmental health knowledge and skills and their applications in developing areas of the world; case studies from Africa, South America, and Southeast Asia.
EHS 504	Genes and the Environment	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Genes and the Environment - In past years disease causation frequently was thought of as a "dichotomy" between genes ("nature") and the environment ("nurture"). More recently this view has been replaced with a more holistic perspective that emphasizes the importance of interactions between genes and environment and/or occupational exposures. The focus of this course will be on interactions between genes and specific environmental and/or occupational exposures. The course will consist of detailed evaluation of specific examples of gene-exposure interactions (e.g., beryllium-related lung disease, peripheral neurotoxicity from organophosphate pesticides, bladder cancer and amine exposure), the underlying science of such examples, medical consequences, potential policy and social implications of current and future scientific knowledge, and review of current and pending legislation that address these issues.
EHS 506	Principles of Toxicology	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Principles underlying the chemical, physiological and anatomical basis of toxicity. Dose-response relationships, toxicokinetics and biotransformation, mechanisms of cellular injury and death, organ system toxicity, developmental toxicology, genotoxicity and toxicogenomics, and chemical carcinogenesis. Principles will be illustrated where appropriate with specific examples of toxicity from environments and pharmaceutical agents.
EHS 508	Principles of Risk Assessment	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course is designed to provide the knowledge and skills necessary to understand risk assessment methods. Students will understand to use the limitations of risk assessment in establishing exposure standards, acceptable concentrations, and the environmental criteria for hazardous substances that present a risk of carcinogenic or other health effects and the suitability of risk assessment for such purposes. The basic approaches to environmental risk assessment will be emphasized, including methods for identifying health effects, modeling of health effects, and derivation of risk estimates. Methods for dealing with uncertainties as well as limitations and criticisms of risk assessment methods will be discussed. Specific examples of risk assessments will be analyzed and critiqued.
EHS 547	Food Science	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	An examination of food composition and the chemical and physical changes that result from food processing, preparation and cooking. Discussion of foods as complex systems containing a wide variety of chemicals including nutrients, phytochemicals, functional ingredients, natural or transferred toxins and additives. Discussion of changes in chemicals with different types of food preservation. Consideration of health risks associated with dietary exposure to selected nutrients and other chemicals. Exploration of the role of sensory analysis related to food acceptance. Overview of important regulations related to the content of food products.
EHS 550	Introduction to Occupational and Environmental Health	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Discussion of the basic concepts of occupational and environmental hygiene; recognition and evaluation of chemical, physical and biological hazards; the human environment; control hierarchies, strategies and technologies; personal protection, criteria and standards; the international dimension; and ethical issues. The course provides basic underpinnings of the nature of theory and practice in occupational and environmental hygiene, and thus provides a structural framework for thinking about the field, identifying linkages between disciplines and specialties, and providing a platform for more advanced study in the individual areas listed.
EHS 576	Microbiology in Environmental Health	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course is basic knowledge about microbes in the environment and its impact on public health. Topics will include: introduction to microbiology; growth and control of microbes in the environments; characterization and identification of microbes in the environment; biofilms and its control; transmission and persistence of health-related microbes in various environments such as water, air, food, indoor and industrial settings; microbial transformation of organic and metal contaminants; spread of antibiotic resistance in the environment.
EHS 582	Principles of Community Air Pollution	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Discussion of economic, nuisance, and health aspects, emphasizing sources, causes, effects, control measures, and the organization and administration of community control programs.
EHS 585	Food Service Mgmt	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course examines the principles of food systems management, defining and applying management theories and functions in food and nutrition settings. Human, material and facility management will be discussed. Students gain an understanding of the tools available for managing effective and efficient food and nutrition organizations. Purchasing and inventory techniques will be examined. Using the foodservice systems model as a guide, it shows students how to transform the human, material, facility and operational inputs of the system into outputs of meals, customer satisfaction, employee satisfaction and financial accountability. This course will cover cost control, methods that are specific to managing food service operations, including food waste and theft.
EHS 616	Introduction to Toxicologic Pathology	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course will provide an introduction to the histologic damage produced by chemical toxicants. A combination of lectures, student-led discussions and slide-reading sessions will be used to integrate concepts of toxicological mechanism, physiology and pathologic outcome. Emphasis will be placed on molecular methods and mechanisms used for the diagnosis and investigative toxicological pathology. The pathology associated with chemicals that damage the major organ systems of humans and mammals will be discussed.
EHS 625	Environment and the Immune Response	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Environmental and occupational exposures to pollutants and toxicants in air, water, and food, whether synthetic or natural, influence human by interacting with the host's immune system. These exposures can either initiate or exacerbate human disease. The course will consist of detailed evaluations of papers, chosen by the students, that explore the impact of environmental and occupational exposures in immunosuppression, autoimmunity, or hypersensitivity.
EHS 631	Vitamins & Minerals	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course provides an in-depth introduction to vitamin and mineral metabolism with particular emphasis on factors that influence nutrient bioavailability, regulation of nutrient homeostasis, and biological function. Other topics include the health effects of inadequate and excessive micronutrient intakes, nutrient requirements across life stages, role of micronutrients in environmental exposures, and controversies/support for nutrient supplementation/fortification programs. The course will consist of lectures on the major metabolic topics for each micronutrient and discussions on nutrient-related health concerns from the current literature.
EHS 652	Evaluation of Chemical Hazards	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Covers the concepts and techniques related to the evaluation of occupational exposures to gases, vapors, and aerosols. Emphasis on operating mechanisms and practical aspects of industrial hygiene air-monitoring equipment, characterizing exposure distributions, and developing sampling strategies. Lectures, laboratory exercises, demonstrations, problems, technical reports, and reading. Primarily for students in occupational health and safety.
EHS 653	Environmental Sampling and Analysis Laboratory	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Laboratory and lecture course on equipment, instrumentation, methodologies, and strategies for measuring environmental chemical and biological contaminants. A primary emphasis is placed on air monitoring for human exposure assessment in the workplace and general environment. Dermal, surface, soil, and water contamination measurements are also covered. Lectures, laboratories, and demonstrations. Primarily for students in environmental health sciences and with interests in occupational and ambient-environment exposure assessments for regulatory compliance and epidemiologic risk estimation.
EHS 654	Control of Exposures to Airborne Contaminants	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Discussion of the principles of controlling airborne contaminants in working and living environments. It deals with general environmental and local exhaust ventilation for indoor spaces, filtration and emission control for the ambient environment, and personal respiratory protection. Specific topics include: basic properties of air and aerodynamics, and behavior of airborne contaminants; general dilution and local exhaust ventilation concepts, methods and design; fan performance and selection; air cleaning equipment; ventilation testing, OSHA and EPA standards, indoor air quality, and others.

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EHS 655	Human Exposure Analy	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Human Exposure Analysis --- Students taking this course will learn how to conduct statistical analysis of human exposure, and will apply these skills to a dataset containing exposure and health outcome data. They will also develop skills for understanding, interpreting, and communicating exposure information and for identifying and communicating evidence-based risk management recommendations.
EHS 657	Advanced Exposure Assessment	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	The course will introduce classical, contemporary, and cutting-edge approaches to the estimation of human exposure to environmental and occupational agents as it relates to epidemiology studies as well as risk science, regulatory compliance, exposure source/route apportionment, and susceptibility factors. Qualitative and quantitative methods in exposure science will be covered, including surrogate measures, exposure modeling, and biological markers of exposure, in addition to statistical concepts such as exposure measurement error and efficient study design.
EHS 660	Environmental Epigenetics and Public Health	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course examines the principles and applications of genomics and epigenomics as they relate to human nutrition, environmental exposures and disease etiology. Course lectures will address gene transcription, epigenetic mechanisms, gene-environment interactions, and environmental epigenomics. Case studies will evaluate these processes using both animal and human examples drawn from the primary literature. Students will also be introduced to current laboratory methods and emerging technologies for examining genomics and epigenomics.
EHS 672	Life cycle assessment: Human Health and Environmental Impacts	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	This course describes how consumption and products affect environmental risks and impacts on human health and on ecosystems. Based on a life cycle approach, this course will first provide an overview of the impacts generated by consumers and by the students themselves. How to carry out Life Cycle Assessment (LCA) of products and services will then be presented. For the Life Cycle Impact Assessment phase, a special focus will be given to the characterization of comparative risks of toxics and substances on human health and ecosystems. This leads to discussion of the potentials and limitations of LCA compared to other assessment tools such as risk assessment and environmental impact assessment. Practical cases studies will be taken from multiple consumption domains, from agriculture and food production up to electronic services.
EHS 680	Environmental Management of Hazardous Substances	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Covers contemporary and emerging approaches to pollution and waste management that integrate 5, 3, economic, and regulatory factors related to hazardous substances. Presentation of site assessment, exposure and risk assessment, and permit application practices, impact assessment in pollution prevention, and risk-cost-benefit analysis. In-depth analysis of selected topics using case studies of ongoing or proposed actions.
EHS 683	Air Pollution and Global Health	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	Clean air is considered to be basic requirement of human health and well-being. However, air pollution continues to pose a significant threat to health worldwide. This course covers air pollutants, their characterization, ambient concentrations, effects on human health and the environment, and international policy-making, guidelines, and governance.
EHS 801	Research and Communication in the Environmental Health Science	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health	The course will cover research and communication skills essential to graduate school success and a professional career in the environmental health sciences. EHS 801 will consist of lectures, discussion sessions, journal clubs, homework assignments, group activities, and several presentations. Guest lecturers will include Departmental Faculty and University communication specialists. Students will be strongly encouraged to integrate their own dissertation aims into all aspects of the seminar.
EHS 574, CHEM 574	Environmental Chemistry	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health, Literature, Science, & Arts Å» Chemistry, Literature, Science, & Arts	Environmental chemistry of the atmosphere, hydrosphere, geosphere and soils. Review of physical and chemical hazards and sources, distribution, transformations, routes to man of environmental contaminants. Human exposure assessment procedures and applications in health risk analysis programs.
EHS 580, NRE 580	Conservation Biology	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health, Nat. Res. and Environment	The world is in the midst of a period of environmental change that is unprecedented in the history of human life. This course examines the causes and consequences of one of the most prominent forms of change in the modern era - loss of biological diversity and its impacts on the ecological functions performed by natural ecosystems. Unlike many Conservation Biology courses, this class will make no false assumption that biodiversity has inherent value, or is universally 'good' for society. Rather, the goals of the class are simply to (i) detail the scientific evidence for why Earth's biological resources are being depleted, (ii) outline how these changes are likely to impact ecosystems and the services they provide to humanity, (iii) describe the social and economic trade-offs we are likely to face as a result of biodiversity loss, and (iv) study the current and emerging management strategies that are used to curb changes in our planet's biological resources.
EHS 588, NRE 475, ENVIRON 475	Environmental Law	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health, Nat. Res. and Environment, Literature, Science, & Arts Å» Program in the Environment, Literature, Science, & Arts	Introduces students to environmental law and the impact of the legal process on decisions that affect the environment. Topics include common law tort actions, toxic tort actions, statutory controls of pollution and other environmentally harmful activities. Additional areas include administrative agency structure and performance, constitutional rights to environmental quality and more.
EHS 608, EPID 608	Environmental Epidemiology	Graduate	Courses that include sustainability	Public Health Å» Environmental Health Sciences, Public Health, Public Health Å» Epidemiology	This course will serve as an introduction to topics in environmental epidemiology, covering major areas of current inquiry in this field. It will convey the basic tools required to critically read the literature and to develop appropriate study designs in light of intended applications. The class meeting will include lectures and student-led discussions. This course will review epidemiologic methods used in evaluating the health effects of physical, biological and chemical agents in the environment and the available evidence in the health effects of such exposures. We will also consider policy and public health applications of the scientific evidence. Topics include lectures of methodology and major environmental exposures, discussions based on review and critiques of current literature, and presentations by outside experts on specific environmental epidemiology issues of current interest. After taking this course, students should have a better understanding of the scope, limitations, applications and future of environmental epidemiology.
EPID 506	Health of Nations: Introduction to International Health	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	This course presents an overview of mortality and disease occurrence in terms of geographic, cultural, nutritional and environmental factors. Reviews health indicators such as infant mortality and economic factors associated with development. Discusses health problems of developing countries and describes programs and organizations involved in addressing them. This course is required for students in the International Health track in Epidemiology but can also be taken by non International Health students.
EPID 554	Introduction to Globalization and Health	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	This course will comprise the initial and discussion of Epid 555, and we are requesting that this material be separated into a new one-credit course to be offered at the beginning of MPH training. The material is introductory, and explores the diverse health impacts of economic, environmental, and cultural globalization. The transnational movement of people, technologies, capital, commodities, toxins, pathogens, ideologies and treatments are affecting people's well-being through many pathways. The changing nature of global relations and the shifting purvey of international organizations and have also had significant health implications.
EPID 582	Molecular Epidemiology	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	The rapid development in molecular techniques since the early 1980s has enhanced the ability of epidemiologists to define and measure both exposures and outcomes. In this course, we will explore the impact of these measures on the design, conduct and analysis of epidemiologic studies by examining successful and unsuccessful applications of these new measurement tools. We will also discuss the ethical issues arising from an enhanced ability to identify individuals with early stage of disease, increased susceptibility or to measure very low levels of exposure in the environment, and sensitize students to the potential conflicts in research ethics arising from collaborative research projects.
EPID 605	Infectious Disease Epidemiology	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Introduction to disease and transmission characteristics, and the descriptive epidemiology of infectious agents. This course will help students to understand the theoretical basis of pathogen transmission and what factors determine patterns of disease occurrence. Students will learn how to apply this understanding to disease prevention and control.

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EPID 621	Cancer Epidemiology	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	This course serves as a basic introduction to the field of cancer epidemiology. The course applied the principles developed in the introductory epidemiology courses to the study of cancer. The course commences with a descriptive account of cancer vocabulary; multistage model of carcinogenesis; and pathologic and biologic basis of cancer. The course topics also include magnitude of the cancer problem; trends in cancer frequency, incidence, burden, mortality, survival and international cancer epidemiology. The concepts of the role of smoking, radiation, lifestyles, nutrition, and other exposures are reviewed. The descriptive epidemiology, natural history, and pathologic and biologic characteristics of selected common cancers, as well as factors related to their etiology are also discussed. The course format consists of a series of lectures by three faculty members and directed readings from the current literature. Students are required to analyze and present assigned papers of a given cancer.
EPID 630	Topics in Environmental Determinants of Infectious Diseases	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	This seminar will focus on environmental determinants of infectious disease, examining the literature that addresses different environmental perturbations ranging from land use and climate change to urbanization and social changes. Students will learn about the natural history of infectious diseases and different analytic methods used to study such systems.
EPID 651	Disaster Management	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Epidemiology and Public Health Management of Disasters --- Introduction to the evolving role of public health and epidemiology in disaster preparedness and response. It uses epidemiological principles to develop skills relevant to disaster preparedness, planning and relief/recovery efforts. Students acquire skills to assess risk and evaluate impacts after disasters, and work on a local health department preparedness project.
EPID 651	Epid&PH Disasters	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Epidemiology and Public Health Management of Disasters --- This course will offer students an overview of natural and man-made disasters as an issue to public health practice and social policy. It will use the foundation of epidemiological principles to develop skills relevant to disaster preparedness, planning, initial response and subsequent relief/recovery efforts. Issues to be examined throughout course activities include: the types of natural and man-made disaster events, their causes, physical and social impacts, and implications; the frequencies, magnitudes, and geographical/sociopolitical distributions of disaster events-along with the epidemiology of injury and disease in the aftermath of disaster; the potential impact of disasters upon community and public health infrastructures; methods to assess risk prior to and evaluate damage following disaster events; issues and considerations in disaster preparedness; interagency roles, responsibilities and coordination in disaster preparedness and management; the man-made disaster of complex emergency, and the health of displaced populations; and issues related to potential disasters from domestic and international terrorism. The course will also discuss contemporary issues such as the recent Tsunami in the South Pacific and the emerging concern about pandemic influenza.
EPID 703	Infectious Disease	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	This course will focus on current topics and new concepts in infectious disease epidemiology. We will discuss factors and issues of diseases most currently prevalent in the world, their status, epidemiology, and methods of control and prevention and barriers to their successful applications. The diseases to be discussed include but are not limited to: diarrheal diseases, HIV/AIDS, tuberculosis, vaccine preventable diseases, influenza, emerging infections, West Nile virus, hemorrhagic fevers, zoonoses, hospital infections including multiple resistant staphylococcus and antibiotic resistance of other organisms.
EPID 722	Pharmacoepidemiology	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Pharmacoepidemiology and Risk Management --- This course will cover the application of epidemiologic methods to study the use of and effects of pharmaceuticals, biologics, and other medical products. In particular, it will cover methods of detecting adverse and beneficial drug effects, including spontaneous reporting systems, ad hoc epidemiologic studies, and the growing use of automated databases. Emphasis will be placed on the need to quantify the frequency of drug effects and risk factors for these drug effects, rather than simply documenting causation. We will also address the renewed interest in adverse events as a major public health problem and how it will impact the health care system through the more recent implementation of pharmaceutical risk management plans or Risk Evaluation and Mitigation Strategies, or REMS, and the implementation of the Sentinel System by FDA. Other topics to be covered in clued measuring the frequency of drug use, the quality of prescribing, and new developments in pharmacoepidemiology methods.
EPID 755	Emerging & Re-Emer Infectious Diseases	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Emerging and re-emerging infectious diseases continue to represent a major worldwide public health problem. Naturally occurring and bioterrorist introduced agents can result in disease and death. Societal, technological and environmental factors have a significant effect on infectious diseases facilitating the emergence of new diseases and the re-emergence of old ones. Recent occurrences that underscore the public health concerns include viral infections, such as HIV, SARS, NIPAH virus, dengue, SLE, West Nile virus and bacterial infections, such as Helicobacter pylori, E. coli O157: H7, and antibiotic resistant organisms including tubercle bacilli, staphylococci, streptococci, and gram negative rods. The role of infectious agents as causative factors of malignancies will be reviewed. We will discuss the general factors that have influenced the occurrence of these diseases and the programs promoted by the Centers for Disease Control and Prevention, the World Health Organization, and other professional organizations, to combat these infectious diseases. The major emerging and re-emerging infections will be discussed emphasizing their identification, epidemiology, recommended control and prevention measures, and their current unresolved problems. We will also discuss the threat of bioterrorism in reintroducing an infectious agent.
EPID 793	Complex Systems	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Complex Systems Modeling for Public Health Research --- An introduction to three major complex systems science modeling techniques with wide applicability to public health. We will cover an introductory overview to each technique, examples of application
EPID 793	Complex Systems	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Complex Systems Modeling for Public Health Research --- An introduction to three major complex systems science modeling techniques with wide applicability to public health. We will cover an introductory overview to each technique, examples of application
EPID 816	Tuberculosis:Pathog	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Tuberculosis: Pathogen, Host and Environment --- Tuberculosis remains one of the deadliest diseases in the world. Social and operational factors, the growing AIDS epidemic, and increasing drug resistance have dramatically compounded the tuberculosis crisis. This course will review the history, epidemiology, biology, pathogenesis, and clinical management of tuberculosis. It will examine the current issues related to tuberculosis and discuss the complex mechanisms that contribute to the almost unparalleled impact of tuberculosis on global health in the past and present time, including the impact of the emergence of AIDS epidemics. Each session will include a one-hour didactic presentation of the specific topics for the session by the instructor followed by a structured class discussion of reading(s) relevant to the session-specific topics that address emerging methods. In the last session, the students will be asked to present their research proposals on an infectious disease of their primary interests using the concepts and methods learned in this class. While the focus of the lectures will be centered on tuberculosis, the discussions will address the applications of general concepts in infectious disease.
EPID 822	Malaria and Other Important Vector-borne Diseases	Graduate	Courses that include sustainability	Public Health Å» Epidemiology, Public Health	Infectious agents transmitted by arthropod vectors produce an enormous disease burden worldwide, especially in underdeveloped countries. Malaria alone kills more than on million people each year, mostly children, and results in 42 million DALYs lost. This course is designed to investigate the epidemiology of malaria and other important vector-borne diseases that principally affect poor people living in tropical countries. The complex interactions influencing transmission dynamics, including immunologic, ecologic, economic and social factors are explored. Options for treatment, prevention and control involving vectors, parasites and human behavior are examined. Analysis also considers the role of other infections, including HIV, as altering transmission and disease.

Course Number	Title	Level	Level of Sustainability	School/College	Description
HBEHED 550	The Challenge of HIV/AIDS: Strengthening Health Systems in Resource-Poor Settings	Graduate	Courses that include sustainability	Public Health Å» Health Behavior & Education, Public Health	Over 40 million people are currently infected with HIV, with the majority of these living in the poorest countries. While new drugs and social interventions in the North are preventing mother-to-child HIV transmission, and have substantially reduced AIDS-related morbidity and mortality, similar interventions are making limited headway in resource-poor settings, especially those most severely affected by HIV/AIDS. Failure is in part due to funding, but more often a consequence of the underlying weakness of health systems. This course will address the operational and social challenges of implementing HIV prevention and care where health and education systems are weak, and political structures fragile. We will critically evaluate a wide range of health and behavioral interventions that have failed or succeeded in sub-Saharan Africa and South Asia, and explore why things work, and attempt to identify models of best practice for diverse settings. We will review emerging opportunities posed by the Global Fund and the Millennium Development Goals to use HIV-related donations to leverage improvements in the overall health sector in poor countries.
HBEHED 603	Population Change: Gender, Family and Fertility in Africa and Asia	Graduate	Courses that include sustainability	Public Health Å» Health Behavior & Education, Public Health	This seminar will review causes and consequences of recent demographic change in Africa and Asia, highlighting emerging trends in gender, family formation and fertility. An exploration of general global and regional trends will be followed by in-depth case-study of five countries: India, China, Burkina Faso, South Africa and Zimbabwe. In each case we will reflect on the relative contributions of demographic pressure, population policies and programs, the international women's movement, and the continuing AIDS epidemic, to the observed trends in sexual behavior, gender norms, marriage, and fertility.
HBEHED 651	Prog Devel Hlth Ed	Graduate	Courses that include sustainability	Public Health Å» Health Behavior & Education, Public Health	Program Development in Health Education --- This course focuses on design of effective health promotion/health education programs. Moves between theoretical bases for program development and examination of practical applications. Initial sessions focus on framework for development of health education/health promotion programs. Subsequent sessions center on specific components of program design and application, as well as evaluation.
HBEHED 690	Environmental Health Promotion	Graduate	Courses that include sustainability	Public Health Å» Health Behavior & Education, Public Health	This class applied health education principles towards understanding and intervening on different environmental hazards. The course will review various kinds of environmental issues, including biochemical toxins, physical hazards, and psychosocial stressors. Students will learn about select data sources from which they may obtain environmental health information. The course will examine the literature on risk perception, risk communication, ethics, and environmental health education and explore how health educators can use resource and conceptual tools to help ameliorate environmental concerns. This course will also examine case studies from individual communities as focal points for discussion. Based on these case studies, students will explore whether extant theories and approaches can help protect vulnerable populations, insure environmental justice, and reduce health disparities.
HMP 624	Health Policy Challenges in Developing Countries	Graduate	Courses that include sustainability	Public Health Å» Health Management & Policy, Public Health	This course examines the state of public health systems in developing countries in sub-Saharan Africa, Latin America, and parts of Asia in the context of global initiatives to dramatically improve health outcomes. The course will cover recent trends in health outcomes, the structure, history and performance of developing country health systems, the international players in health (including the UN and other multilateral and bilateral organizations), key constraints to improving health care delivery, and potential ways forward. This course focuses on international and national health policy as it pertains to developing countries but also deals with questions of health management and implementation of complex systems. There are wide, and in some instances growing, global disparities in health status. In some countries in southern sub-Saharan Africa, for example, the AIDS epidemic has cut 20 years from average life expectancy over the past decade while the developed world has enjoyed a boom of new health discoveries and advances. AIDS and a resurgence in malaria and TB have added to the tremendous strain on fragile health systems, which have already been ravaged by years of underfunding. Government-run health systems in developing countries, whose main role is to deliver a modest package of essential interventions for largely preventable and/or treatable conditions, are on the verge of collapse.
HMP 653	Law & Public Health	Graduate	Courses that include sustainability	Public Health Å» Health Management & Policy, Public Health	The purpose of this course is to examine the legal context of the relationship the individual and the community, and to understand public health regulation in the context of a market-driven system. The goals of the course are for students to understand generally: constitutional authority and limits on governmental intervention in public health (i.e., individual rights vs. society's rights); the function of the interactions between courts, legislatures, and regulators; how law will affect students as strategic thinkers in public health positions; how to recognize legal result and communicate with attorneys; and the process of public health regulation and potential legal barriers to public health intervention strategies. Specific topics will vary, but will usually include; the nature and scope of public health authority; constitutional constraints on public health initiatives; tobacco control; youth violence; injury prevention; the spread of communicable disease; and regulating environmental risk.
PUBPOL 510	The Politics of Public Policy	Graduate	Courses that include sustainability	Public Policy (Ford)	Policy analysis is a profession that brings systematic thinking and social scientific evidence to bear on substantive problems, but policymakers seldom defer to expert judgments. Many see policy analysis as material to be deployed selectively and strategically in political battles fought on other terms. To be effective, policy specialists must understand the political environments in which they operate, including the participants who shape policy within particular domains; the ways in which they perceive problems and solutions; the interests and ideologies likely to govern their actions; the strategies they use; and the institutional arrangements and processes that shape their behavior and constrain their decisions. The goal of the core politics course is to help you approach such matters more critically and strategically, especially as you take on new jobs in an upwardly mobile career. Every section of the course emphasizes a different level of governance: International politics, comparative politics, or national/subnational politics. For more information, students should consult the descriptions for the individual sections available at fordschool.umich.edu .
PUBPOL 534	The Economics of Developing Countries	Graduate	Courses that include sustainability	Public Policy (Ford)	Surveys what we do and don't know about economic growth and poverty alleviation in developing countries. We begin by discussing alternative perspectives on the goals of development. The substantive sections of the course address specific topics relevant to developing countries, such as: technology and growth; international trade and investment; international migration and remittances; coping with risk; public health and education; corruption and governance; and public finance.
PUBPOL 580	Values, Ethics and Political Advocacy	Graduate	Courses that include sustainability	Public Policy (Ford)	Makes students sensitive to and articulate about the ways in which moral and political values come into play in the American policy process, particularly as they affect non-elected public officials who work in a world shaped by politics. Topics covered include the tensions between ethics and politics, an introduction to various moral theories that figure in contemporary policy debates, a consideration of the principal values that animate American politics, and issues and dilemmas in professional ethics. The course addresses issues that affect international as well as U.S. policy and politics.
PUBPOL 621	Peacebuilding	Graduate	Courses that include sustainability	Public Policy (Ford)	Peacebuilding: Law, Diplomacy, and the Transition from Conflict --- This course will examine how the U.S. and other international actors seek to help pacify, stabilize, and rebuild societies embroiled or emerging from war. We will review some major problems faced by conflict-ridden societies and use case studies to examine specific aspects of "peacebuilding" in more detail: forging settlements, peacekeeping, economic reconstruction, and transitional justice.
PUBPOL 650	Introduction to Science and Technology Policy Analysis	Graduate	Courses that include sustainability	Public Policy (Ford)	As it exposes students to the landscape of science and technology policymaking in the US and abroad, this course introduces theories and methodologies for science and technology policy analysis, with literature drawn from a range of disciplines, including political science, economics, sociology, and history. Students will learn how science and technology policy is made, with specific attention to the roles of government agencies, expert advisory committees, private industry, the courts, and the public. They will also gain tools for science and technology policy analysis, including research funding allocation methods, science and technology assessment, innovation theory, and cost-benefit analysis. The course will also explore how national and international contexts shape science and technology policymaking.

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PUBPOL 671	Policy and Management in the Nonprofit Sector	Graduate	Courses that include sustainability	Public Policy (Ford)	This course provides a survey of policy and management issues in the nonprofit sector in the US. It focuses on how nonprofit organizations differ from governments and private firms and the implications of these differences for public policy and management. Assignments include theoretical readings, case studies and readings on contemporary events in the nonprofit sector. Among the topics covered are the nature and variety of nonprofit organizations, governance and accountability, ethics, financing and economic decision-making, and performance measurement.
PUBPOL 674	Economic and Social Policies in a Selected Emerging Market Economy	Graduate	Courses that include sustainability	Public Policy (Ford)	This seven-week, course is open to any graduate student focuses on the evolution of a given country's economic, political and social institutions and policies, beginning with the historical origins of the country. Students will examine why the country embarked on the development strategies in different periods and what the consequences of those strategies were. The course will progress to the current period and examine the pressing policy issues facing the country today and how the leaders are dealing with those problems given the internal and external constraints. The interests of the students will help shape which current policies will be examined more closely in the last part of the course. Grades will be based on one 10-page policy paper and a final exam.
PUBPOL 735	Professional Development	Graduate	Courses that include sustainability	Public Policy (Ford)	Pathways to Professional Success --- Researchers have found that a person's IQ and classroom performance is at best a moderate predictor of long term success. This seminar will help you learn skills (beyond analytical skills) that will help you achieve the professional goals that you desire; self-awareness, developing sustainable and ethical power and influence, managing organizational politics; managing your relationships with bosses, peers, and direct reports, effective networking, creating high performing teams, and achieving work/life balance.
PUBPOL 754	Research Seminar in Science, Tech and Public Policy	Graduate	Courses that include sustainability	Public Policy (Ford)	Introduces students to topical issues in science and technology policy. Those currently in the science policymaking arena as well as experts in applied science policy research will be invited to campus to participate as seminar speakers. By interacting with those active in science policy circles, it is hoped that students will gain a real appreciation for the processes and underpinnings of current national science policy.
PUBPOL 756	Local Government, Opportunity for Activism	Graduate	Courses that include sustainability	Public Policy (Ford)	What goes on in city government is in many ways more important to our lives than what happens in Washington. This course goes beyond the structure and theory of municipal government to look at how things really happen at the local level. It will explore the underlying dynamics of the city/suburb conflict, sprawl vs. density and how these issues influence local economies and state legislatures. There will be a focus on the interaction of citizen activists and elected officials in effecting change. Topics will include running for office, environmental and affordable housing campaigns and activist-generated ballot initiatives. Both past and present campaigns will be examined, including case studies of both successful and failed initiatives. Students will explore the unfolding Greenbelt and Greenway programs, and how these proposals may impact sprawl and affordable housing. Guest speakers will include elected officials and activists from past and present campaigns for social and environmental change.
PUBPOL 761	Politics of Hlth Pol	Graduate	Courses that include sustainability	Public Policy (Ford)	The Politics of Health Policy --- This course will examine the politics of health care in the U.S. at the state and national level. Topics will include the political factors affecting Medicare reform, Medicaid spending, health insurance coverage, medical research, pharmaceutical regulation, and other topics, with special attention to the role of private power in health policymaking.
SW 611	Social Change Theories	Graduate	Courses that include sustainability	Social Work	This course will review theories and research from the social sciences on social change, focusing especially at the societal level. Theories of social conflict, interest groups, and social movements, and such processes as consciousness-raising will be covered. Dynamics of the diffusion of innovations in society will also be addressed. Examples will be drawn from areas of practice in which social workers are involved, such as mental health and chemical dependency, child and family welfare, civil rights, health care, and consumer protection.
SW 657	Multicult&Multiling	Graduate	Courses that include sustainability	Social Work	Multicultural, Multilingual Organizing --- This course will examine multicultural, multilingual organizing as a process of promoting intergroup relations and social development at the community level. Included will be content on efforts by diverse groups (inclusive of the following dimensions: ability, age, class, color, culture, ethnicity, family structure, gender (including gender identity and gender expression), marital status, national origin, race, religion or spirituality, sex, and sexual orientation, as well community of residence) to maintain their identities while also interacting and cooperating across cultural boundaries. Students will apply existing practice to multicultural situations and develop emergent skills for the future. This course will examine concepts and techniques of multicultural, multilingual organizing. Relevant strategies and tactics that promote positive intergroup relations and pluralism at the community level will be analyzed (e.g., interethnic planning and multigroup coalition-building). Students will be prepared for the roles that social workers can expect to serve in building a racially, ethnically, and religiously heterogeneous society.
SW 671	Social Policy Development & Enactment	Graduate	Courses that include sustainability	Social Work	This course will review the overall design of human service systems, how to plan for and design such systems, how to develop the legislative mandates and regulations that operationalize these designs, and how to facilitate their formal enactment. Students will learn the analytic skills associated with the development of policies that give specification to human service systems, as well as the more interactional skills associated with facilitating the enactment of these policies.
SW 709	Dialog Facil Soc Jus	Graduate	Courses that include sustainability	Social Work	Dialogue Facilitation for Diversity and Social Justice --- This course is designed to give students a foundation in the awareness, knowledge, understanding, and skills needed to effectively carry out multicultural social work practice with populations who
SW 716	Int'l Comm Org	Graduate	Courses that include sustainability	Social Work	International Community Organization --- The course examines core concepts of community practice, major models of comparative policy work, and practical steps for community-based work. It provides knowledge and skills in comparative urban policy, community-based work with youth, and non-governmental social justice community organization. Students will analyze the ways in which countries use different approaches to mobilizing people for collective action, challenging oppressive structures and processes, building organizational capacity, implementing action plans, and generating power in the community.
SW 716	Int'l Comm Org	Graduate	Courses that include sustainability	Social Work	International Community Organization --- The course examines core concepts of community practice, major models of comparative policy work, and practical steps for community-based work. It provides knowledge and skills in comparative urban policy, community-based work with youth, and non-governmental social justice community organization. Students will analyze the ways in which countries use different approaches to mobilizing people for collective action, challenging oppressive structures and processes, building organizational capacity, implementing action plans, and generating power in the community.
SW 729	Multicul Work	Graduate	Courses that include sustainability	Social Work	Multicultural Work with Individuals, Families and Groups --- This course will focus on how to implement methods that are sensitive to a wide variety of human differences for multicultural social work with individuals, families, groups. Students will learn to apply theories and concepts of culture and other human differences to understand and work with diversity in individual, family, and group functioning. Students will critique prevailing models of multicultural practice in relation to their sensitivity to issues in different groups. Students will be encouraged to deepen their own multicultural competence and consciousness by: 1) learning how to use and adjust for the impact of their own characteristics and experiences on a) their perceptions and values of others' behaviors, and b) the behaviors that clients choose to display in interactions with them; and 2) assessing how the larger contexts of the practice setting and society influence their clients and therapeutic relationships. Students will also learn to assess and address how societal power and status structures and the dynamics of privilege and oppression contribute to the creation of differences, to the types of problems that clients experience, and to miscommunication and distrust in therapeutic relationships.
SW 796	Adv Top Micr/Macr SW	Graduate	Courses that include sustainability	Social Work	Advanced Topics in Micro and Macro Social Work --- This course presents advanced topics in both micro and macro social work practice. The topics may include emerging cross-cutting practice methods, advanced application of methods covered in other required methods courses, and applications of methods in specific populations.

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SW 875	Soc Wrk&Economics	Graduate	Courses that include sustainability	Social Work	Social Work and Economics --- This seminar provides a foundation and overview for students interested in understanding the intersection between social work and economics. The readings bring together economic theory and scholarship as they relate to contemporary social work and social welfare issues. Topics, chosen to illustrate the intersection of the two fields and to bring together faculty from both schools, may include poverty, education, and health care. Beyond the joint Economics/Social Work students, the course is expected to attract joint Social Work/social science students from other disciplines, as well as graduate students in economics, political science, sociology, psychology, and other fields. The course will include activities such as guest speakers, works in-progress discussions, readings, and presentations.
SW 651, UP 651	Planning for Organizational & Community Change	Graduate	Courses that include sustainability	Social Work, Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This course will examine social planning as a systematic process of developing and implementing plans and programs that promote social justice and well-being at the community level. A range of analytic and interactional tools will be reviewed, including those which assess community strengths and needs, set goals and priorities, formulate action plans, develop organizational structures, build support for implementation, and monitor and evaluate risk results. This course will also analyze major models of planning practice, the socio-political context within which practice takes place, and strategies for expanding institutional relationships and collaborative partnerships aimed at a more equitable distribution of goods, services, and resources.
SW 655, UP 655	Neighborhood Planning	Graduate	Courses that include sustainability	Social Work, Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	The course focuses on concepts and issues that characterize community planning for neighborhoods and explores interdisciplinary approaches to neighborhood analysis and intervention. The initiatives of community development corporations, city agencies, and the federal government are examined through lectures, readings, and guest speakers. The central questions the course examines are: Why do neighborhoods experience prosperity and decline? Which approaches (e.g. economic development, urban design, social service delivery, housing rehabilitation, community organizing and empowerment) are likely to be most effective in revitalizing neighborhoods? How do we assess existing approaches to neighborhood revitalization? Emphasis is placed on discovering appropriate information sources, learning to ask relevant planning questions, and formulating program alternatives and recommendations.
ARCH 412	Architectural Design I	Undergrad	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman)	The sequence continues in the integration and translation of the knowledge, understanding, experience and skill gained in previous courses into architectural solutions to satisfy given needs, conditions and means. The primary emphasis is the development of insight into the solution of building and environmental design problems: how they are studied (analysis), how they are approached and carried through (process) and how they are conceptualized and developed (synthesis). Assigned projects require the student to consider issues of human scale and behavior, environmental responsibility and building construction at a level of greater complexity than previously encountered.
ARCH 425	Sustainable Systems II	Undergrad	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman)	This introductory course addresses human needs and comfort in relation to the natural and man-made environments. Specific topics include: daylighting and electrical lighting systems, building acoustics, code requirements for energy conservation, communication systems, and elevator systems.
ARCH 423, UP 423, ENVIRON 370	Introduction to Urban and Environmental Planning	Undergrad	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Literature, Science, & Arts Å» Program in the Environment, Literature, Science, & Arts	This overview course explores urban and environmental planning issues and problems, and reviews the ways planners grapple with them. Speakers from within and outside of the University describe the content of the issues and state-of-the-art intervention programs and techniques. Topics covered include the origins and history of urban planning, the legal aspects of planning, planning for sustainable development, metropolitan growth and urban sprawl, urban design, housing and real estate development, transportation planning, environmental planning, planning for open space, and historic preservation, brownfield redevelopment, waste management, and third world development.
UP 425	Urban Systems	Undergrad	Courses that include sustainability	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This course introduces students to: 1. the function of cities: the systems of infrastructure (including roads, transit, water and sewer, and IT), land use, and natural environment that together define the physical reality of cities; and 2. the tools of analysis traditionally employed by the urban planner to make sense of these systems, including demography, GIS, statistics, design, and policy analysis. The course provides a practical introduction to how cities work and how planners understand that work. It is NOT a methods course. It introduces a handful of analytic tools just enough to give students an appreciation for how those tools can help us understand urban life. Work in the course is project based, including problem sets and student presentations.
ARTDES 314	Change by Design	Undergrad	Courses that include sustainability	Art and Design (Stamps)	n/a
BA 200	Businesses and Leaders: The Positive Differences	Undergrad	Courses that include sustainability	Business (Ross)	Businesses and their leaders coexist with society and are both influenced by and influencers of societal issues.Å In this course, we explore the competing tensions of how business practices and leaders impact organizational performance as well as broader social outcomes across the private, public, and nonprofit sectors.Å We will look at social issues that arise from business operations that result in threats to public goods and market failures; how societal issues create space for business opportunities; and the leveraging of corporate resources to solve societal problems that create values for stakeholders and shareholders.Å In addition to studying the role of business in society, this course examines personal and professional responsibility.Å This will entail students examining the connections between personal values, career goals, ethical decision making, and moral courage.Å Also, students will reflect upon their responsibilities and contributions to the Ross community and the business profession, and develop personal plans to guide their actions.
BE 311	Public Policies Toward Business	Undergrad	Courses that include sustainability	Business (Ross)	This course aims to enhance students' understanding of the role of government in a market economy and to develop students' analytical and presentation skills in discussing antitrust and regulatory issues. The emphasis of the course will be on the economic rationales behind government intervention in markets, the various forms of intervention, and their appropriateness in various contexts. Contexts explored will include antitrust policies, environmental, health and safety regulations. An important part of the course will be spent examining specific business cases with a focus on the type of intervention used in each and the outcome of such interventions.
LHC 309	Business Ethics & Accountability	Undergrad	Courses that include sustainability	Business (Ross)	In an increasingly complex and global business world, ethical decision making is a crucial skill for all business leaders. The ability to make ethically sound judgments and persuade others of the importance of a sometimes unpopular choice-and to do so under pressure-will be an advantage during a career in any type of organization. The Business Ethics and Accountability course provides students with the tools necessary to spot and avoid ethical risk and then to use their ethical reasoning and analysis skills to succeed as leaders in their chosen field. The course will first cover the background and justification for applying ethical frameworks to business action. Next, the course addresses distinct topics such as the nature of the ethical corporation, stakeholder analysis, and the legal and economic influences on decision making and negotiation. Finally, the course examines the ethics of the commercialization of science and technology and its uses, ethical choices while weathering a crisis, and international topics and multinational operations (such as cross-cultural ethics and corruption). The course concludes with a discussion of current topics in business ethics, such as environmental sustainability and the challenges of serving the Base of the Pyramid.
STRATEGY 290	Business Strategy	Undergrad	Courses that include sustainability	Business (Ross)	Business Strategy --- This course introduces fundamental issues in the design of business-level strategy. Major topics covered in the course include the analysis of industry structure, the strategic analysis of firm capabilities, analysis of the activity system for cost and differentiation advantage, and the sources and sustainability of competitive advantage. The course provides the foundation for more advanced strategy topics, including competitive dynamics and corporate-level strategy, as well as dynamic capabilities strategies for growth, global strategy, and strategy execution.
STRATEGY 310	The World Economy	Undergrad	Courses that include sustainability	Business (Ross)	When a firm conducts business internationally, it encounters problems and challenges not found in its domestic market. These arise from two different aspects of the international business environment. One aspect involves the crossing of national boundaries, which involves financial, legal, and political differences. The second aspect of the international environment arises from the unique cultural, economic, and political situation within each foreign market where the firm conducts business. This course introduces the student to the various dimensions of the world economy and to the characteristics of foreign countries that are important for economic activity.

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STRATEGY 411	The Corporation in Society	Undergrad	Courses that include sustainability	Business (Ross)	We live in extraordinary times. Corporations are among the wealthiest and most powerful institutions on the world's stage today. At the same time, corporations are more vulnerable than ever before. Globalization unleashed a set of competitive forces that place firms at risk, no matter their size. Managers face enormous pressure. Their firms' wealth and power act as a kind of magnet. Civil society routinely asks corporations to invest directly in our social life. Regardless of their productive capabilities, firms field requests to invest in such areas as education and health care. Managers must decide what, if anything, to do. And, at the same time, these same managers need to marshal their resources to produce and deliver high quality and profitable goods and services in a very competitive global marketplace. Leading a business that is at once socially responsive and economically competitive is a daunting challenge. This course will examine the role of the corporation in society and in so doing, begin to develop the leadership capability we need to meet these challenges.
ENGR 100	Introduction to Engineering	Undergrad	Courses that include sustainability	Engineering	Focused team projects dealing with technical, economic, safety, environmental, and social aspects of a real-world engineering problem. Written, oral, and visual communication required within the engineering profession; reporting on the team engineering projects. Description of the role of the engineer in society; engineering ethics; organization and skills for effective teams.
AAS 432	Violent Environments: Oil, Development and the Discourse of Power	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	This course will examine and compare discourses and practices concerned with resource extraction, resource distribution, energy security, and "modernity" in Africa, Europe, the Middle East, and Latin America. In particular, we'll explore how oil exploration in postcolonial states has created spaces of violence and possibilities for development, and has continually reshaped the idea of what constitutes the nation.
AOSS 103	Intro Space Weather	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	Introduction to Space Weather --- "Space Weather" is an emerging discipline of space science that studies the conditions in space that impact society and Earth's technological systems. Space weather is a consequence of the behavior of the sun, the nature of Earth's magnetic field and atmosphere, and our location in the solar system.
AOSS 441	Meteorology and Climate of the Rockies	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	This course introduces principles of atmospheric and environmental sciences using the Rocky Mountains as a field laboratory. Students will develop an understanding of meteorological processes to explain variations in microclimates, and the important of mountainous regions on the earth's climate. Students will gain field-based knowledge of mountain climates and instrumentation.
AOSS 462	Instruments for Atmospheric and Space Sciences	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	Instruments for atmospheric and Space Sciences: Introduction to fundamentals of atmospheric, space-based, and meteorological instrumentation. Includes basics of electronic sensors, optics, lasers, radar, data acquisition/management, error analysis, and data presentation. Consists of two lecture and one lab each week, and a term-based term project.
AOSS 473	Climate Physics	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	Introduction to physical mechanisms that determine climate, including relevant atmospheric, hydrologic, cryospheric, solar/orbital, volcanic, and human processes. Discusses quantitative and descriptive techniques to understand how radiative, thermodynamic, and dynamic processes distribute energy throughout the Earth System, drive climate feedback, and determine the sensitivity of Earth's climate to external perturbations.
AOSS 479, ENSCEN 479	Atmospheric Chemistry	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	Thermo-chemistry, photochemistry and chemical kinetics of the atmosphere; geo-chemical cycles, generation of atmospheric layers and the effects of pollutant are discussed.
AOSS 475, ENSCEN 475	Earth-Ocean-Atmosphere Interactions	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Engineering Å» Civil & Environmental Eng., Literature, Science, & Arts Å» Program in the Environment, Literature, Science, & Arts	Develops students' abilities to integrate processes important to global change; surface characteristics, hydrology, vegetation, biogeochemical cycles, human dimensions. Analysis of current research advances. Interdisciplinary team projects with oral and poster presentations.
AOSS 420, NAVARCH 420, ENSCEN 420	Environmental Ocean Dynamics	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Engineering Å» Naval Arch. & Marine Eng.	Physical conditions and physical processes of the oceans; integration of observations into comprehensive descriptions and explanations of oceanic phenomena. Emphasis on wave and current prediction, optical and acoustical properties of seawater, currents, tides, waves and pollutant transport.
AOSS 171, BIOL 110, ENSCEN 171, ENVIRON 110, GEOSCI 171	Introduction to Global Change -- Part I	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Biology, Literature, Science, & Arts, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts Å» Geological Sciences, Literature, Science, & Arts Å» Program in the Environment	Students learn about the evolution of the universe, Earth, our changing environment and our planets living organisms. Global Change I, which is part of the GC curriculum, assumes no prior science background. Homework and laboratories use computer-based systems modeling and analysis, and includes a group presentation.
AOSS 320, EARTH 320	Earth Systems Evolution	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Introduction to the physics and chemistry of Earth. Gravitational energy, radiative energy, Earth's energy budget, and Earth tectonics are discussed along with chemical evolution and biogeochemical cycles. The connections among the carbon cycle, silicate weathering, and the natural greenhouse effect are discussed. Required for AOSS/GS-321, which introduces Earth system dynamics.
AOSS 320, EARTH 320	Earth Systems Evolution	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Introduction to the physics and chemistry of Earth. Gravitational energy, radiative energy, Earth's energy budget, and Earth tectonics are discussed along with chemical evolution and biogeochemical cycles. The connections among the carbon cycle, silicate weathering, and the natural greenhouse effect are discussed. Required for AOSS/GS-321, which introduces Earth system dynamics.
AOSS 321, EARTH 321	Earth System Dynamics	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Earth Systems Dynamics --- This course will describe the major wind systems and ocean currents that are important to climate studies. The primary equations will be developed and simple solutions derived that will explain many of these motions. The relations among the dynamics and other parameters in the climate system will be illustrated by examples from both paleo and present day systems.
AOSS 323, EARTH 323	Earth System Analysis	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Earth System Analysis --- Introduction to the analysis of Earth and Atmospheric Science Systems. Topics include linear systems, harmonic analysis, sampling theory and statistical error analysis. Lectures emphasize underlying mathematical concepts. Labs emphasize application of mathematical methods to analysis of field data in a computer programming environment. Applications include turbulent air motion in the planetary boundary layer, cloud and precipitation microphysical composition, oceanic wave propagation, stratospheric ozone depletion and satellite remote sensing.
AOSS 350, EARTH 350	Atmospheric Thermodynamics	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Atmospheric Thermodynamics --- Fundamentals of radiative transfer, thermodynamics, and cloud Physics of the atmosphere, including absorption, emission, and scattering of radiation, energy balance, adiabatic processes, entropy, water-air systems, and the cloud condensation, microphysics and precipitation processes.
AOSS 370, EARTH 370	Solar-Terrestrial Relations	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Introduction to solar terrestrial relations with an overview of solar radiation and its variability on all time-scales. The effects of this variability on the near-Earth space environment and upper atmosphere are considered, as well as effects on the lower and middle atmosphere with connections to weather and climate. Subjects are approached through extensive data analysis, including weekly computer lab sessions.
AOSS 380, EARTH 381	Introduction to Atmospheric Radiation	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Basic concepts and processes of radiative transfer including radiometric quantities, electromagnetic spectrum, absorption, emission, scattering. The physics laws governing these processes including the Planck Law and the Kirchhoff Law. Radiative properties of atmospheric constituents. Reflection and refraction. Introductory-level descriptions of relevant applications in atmospheric sciences and climate physics.

Course Number	Title	Level	Level of Sustainability	School/College	Description
AOSS 401, EARTH 401	Geophysical Fluid Dynamics	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Dynamics of the oceans and atmosphere. Equations of motion in spherical coordinates, beta-plane approximation, wave properties in the oceans and atmosphere.
AOSS 410, EARTH 409	Earth System Modeling	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Introduction to Earth System Modeling; discussion of energy balance models, carbon cycle models, and atmospheric chemistry models with multiple time scales; methods for numerical solution and practice building and analyzing results from models.
AOSS 414, EARTH 414	Weather Systems	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Weather Systems --- Introduction to the basic characteristics, thermodynamics, and dynamics of atmospheric weather systems on Earth and other planets. The students are exposed to observations of weather systems while reviewing non-dimensional analysis, dynamics and thermodynamics. Weather systems on earth are compared to that of other planets and analytical tools are used to gain insights into their basic physics.
AOSS 422, EARTH 423	Boundary Layer Meteorology	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	This course explores processes in the atmospheric boundary layer, which plays an important role in the exchange of energy, mass and momentum between land and atmosphere. Topics include applications of governing atmospheric equations, atmospheric turbulence, turbulent kinetic energy, the surface energy balance, and the collection and analysis of field flux tower data.
AOSS 440, EARTH 454	Meteorological Analysis Laboratory	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	This course provides an introduction into the analysis of both surface-based and remotely-sensed meteorological data. The development and application of operational numerical forecast models will be discussed. Techniques for the prediction of both synoptic and mesoscale meteorological phenomena will also be presented.
AOSS 451, ENSCEN 451, EARTH 457	Atmospheric Dynamics I	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Description/discussion of quasi-geostrophic energetics; fronts; the mean circulation; planetary and equatorial waves; overview of the dynamics of the middle atmosphere; wave-mean flow interaction; spectral methods; and tropical meteorology.
AOSS 463, ENSCEN 463	Air Pollution Meteorology	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Weather and motion systems of the atmosphere; topographic influences in winds; atmospheric stability and inversions; atmospheric diffusion; natural cleansing processes; meteorological factors in plant location, design and operation.
AOSS 474, EARTH 474	Ice Sheets, Glaciers, and Climate Change	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	They dynamics and mass balance of ice sheets and glaciers introduced along with mathematical theories describing how ice sheets and glaciers flow and current methods of observation.
AOSS 495, ENSCEN 495	Upper Atmosphere and Ionosphere	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Basic physical and chemical processes important in controlling the upper/middle atmosphere and ionosphere: photochemistry, convection, diffusion, wave activity, ionization, heating and cooling. The terrestrial, as well as planetary atmospheres and ionospheres are to be considered.
AOSS 421, EARTH 421, ENVIRON 426	Introduction of Physical Oceanography	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts, Literature, Science, & Arts Å» Program in the Environment	This course examines the fundamentals of physical oceanography; the physical properties of the ocean and water masses; circulation of the atmosphere; wind-driven and buoyancy-driven ocean circulation; tides; surface and internal waves; eddies; and mixing.
AOSS 102, ENVIRON 102, EARTH 122	Extreme Weather	Undergrad	Courses that include sustainability	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Program in the Environment, Literature, Science, & Arts, Literature, Science, & Arts Å» Geological Sciences	This course provides an introduction to the physics of extreme weather events. The course uses examples of the thunderstorms, jet stream, floods, lake-effect snowstorms, lightning, thunder, hail, hurricanes, and tornados to illustrate the physical laws governing the atmosphere. Participants apply these principles in hands-on storm forecasting and weather analysis assignments.
BIOMEDE 221	Biophysical Chemistry & Thermodynamics	Undergrad	Courses that include sustainability	Engineering Å» Biomedical Engineering, Engineering	This course covers the physico-chemical concepts and processes relevant to life. The emphasis lies on the molecular level. Topics: Biomimetics and Motivation; Energy and Driving Forces; Biochemical Equilibria; Aqueous Solutions; Molecular Self-Assembly in Chemistry, Biology, and Nanotechnology; Bio-electrochemistry; Biopolymers; Molecular Recognition and Binding Equilibria in Biology.
BIOMEDE 417	Electrical Biophys	Undergrad	Courses that include sustainability	Engineering Å» Biomedical Engineering, Engineering	Electrical Biophysics --- Electrical biophysics of nerve and muscle; electrical conduction in excitable tissue, quantitative models for nerve and muscle, including Hodgkin Huxley equations; biopotential mapping, cardiac electrophysiology, and functional electrical stimulation; group projects.
BIOMEDE 476	Biofluid Mechanics	Undergrad	Courses that include sustainability	Engineering Å» Biomedical Engineering, Engineering	Biofluid Mechanics --- This is an intermediate level fluid mechanics course, which uses examples from biotechnology processes and physiologic applications including the cardiovascular, respiratory, ocular, renal, musculo-skeletal and gastrointestinal systems
BIOMEDE 479	Biotransport	Undergrad	Courses that include sustainability	Engineering Å» Biomedical Engineering, Engineering	Fundamentals of mass and heat transport as they relate to living systems. Convection, diffusion, active transport, osmosis and conservation of momentum, mass and energy will be applied to cellular and organ level transport. Examples from circulatory, respiratory, renal and ocular physical will be examined.
BIOMEDE 484, ENSCEN 484, NERS 484	Radiological Health Engineering Fundamentals	Undergrad	Courses that include sustainability	Engineering Å» Biomedical Engineering, Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts, Engineering Å» Nuclear Eng. and Radiological Sciences	fundamental physics behind radiological health engineering and topics in quantitative radiation protection and radiation quantities and measurement, regulations and enforcement, external and internal dose estimation, radiation biology, radioactive waste issues, radon gas, emergencies, and wide variety of radiation sources from health physics perspective.
CHE 230	Material and Energy Balances	Undergrad	Courses that include sustainability	Engineering Å» Chemical Engineering, Engineering	An introduction to material and energy balances in chemical engineering applications, including environmental and biological systems. Engineering problem solving, the equilibrium concept, first law of thermodynamics. Introduction to chemical engineering as a profession.
CHE 330	Chemical and Engineering Thermodynamics	Undergrad	Courses that include sustainability	Engineering Å» Chemical Engineering, Engineering	Development of fundamental thermodynamic property relations and complete energy and entropy balances. Analysis of heat pumps and engines, and use of combined energy-entropy balance in flow devices. Calculation and application of total and partial properties in physical and chemical equilibria. Prediction and correlation of physical/chemical properties of various states and aggregates. Elements of statistical thermodynamics.
CHE 343	Separation Processes	Undergrad	Courses that include sustainability	Engineering Å» Chemical Engineering, Engineering	Introduction and survey of separations based on physical properties, phase equilibria, and rate processes. Emphasis on analysis and modeling of separation processes. Staged and countercurrent operations. Includes applications to chemical, biological, and environmental systems.
CEE 200	Intro to Civil & Environmental Engineering	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	An introduction to the nature and scope of the civil and environmental engineering discipline and specialty programs. Includes case studies from practice and information about academic and professional opportunities for CEE students.
CEE 230	Energy and Environment	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	The laws of thermodynamics are presented and applied to energy technologies used for electric power generation, transportation, heating, and cooling. Physical properties of fuels and materials used in energy production are discussed. The environmental impacts, resource constraints, and economic factors governing conventional and alternative energy technologies are considered.

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CEE 260	Environmental and Sustainable Engineering Principles	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Mass balance modeling of contaminant fate and transport in the environment; pollutant types, sources, controls and treatment processes; pollution prevention, life-cycle assessment and economic decision-making concepts for minimizing global, regional and local environmental impact in engineering design; government legislation and regulation, exposure pathways and health risks of priority pollutants.
CEE 270	Statistical Methods for Data Analysis and Uncertainty Modeling	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Statistical Methods for Data Analysis and Uncertainty Modeling --- Introductory probability and statistics with emphasis on data analysis and uncertainty modeling for engineering and environmental systems. Descriptive statistics, graphical representation of data, linear regression, correlation, discrete and continuous probability distributions, conditional probability, estimation, statistical inference, hypothesis testing, sampling design, load factors, extreme events, reliability analysis.
CEE 303	Computational Methods of Engineering and Scientists	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Applications of numerical methods to infrastructure and environmental problems. Development of mathematical models and computer programs using a compiled language (FORTRAN). Formulation and solution of initial and boundary-value problems with emphasis on structural analysis, fluid flow, and transport of contaminants.
CEE 345	Geotechnical Engineering	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Soil origins, classification, and index properties; phase relationships; earth moving and soil compaction; groundwater seepage; compressibility and consolidation; settlement; shear strength and failure; applications to foundations; retaining structures and slopes.
CEE 402	Professional Issues and Design	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Multidisciplinary team design experience including consideration of codes, regulations, alternate solutions, economic factors, sustainability, constructibility, reliability, and aesthetics in the solution of a civil or environmental engineering problem. Professionalism and ethics in the practice of engineering.
CEE 421	Hydrology	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Description/discussion of fundamentals of surface-water hydrology, flow in open channels, and flood hazard mitigation; rainfall-runoff relations; unit hydrograph method; uniform and nonuniform flow in open channels; measurement and control of river flow; flood waves in rivers, floodplains, and reservoirs; design of storage basins, storm channels, and culverts.
CEE 446	Engr Geol Site Char	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Engineering Geology and Site Characterization --- Composition and properties of rocks and soil, geologic processes, geologic structures and engineering consequences, mapping and map analysis, airphoto interpretation, in-situ testing of soils and rock, field demonstration, civil engineering facility siting.
CEE 460	Design of Environmental Engineering Systems	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	Design and theoretical understanding of environmental processes; biological, physical, and chemical processes, and reactor configurations commonly used for water quality control; applications to the design of specific water and wastewater treatment operations; discussion of pollution prevention and green engineering options.
CEE 465	Environmental Process Engineering	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering	An introduction to the analysis, characterization and principles of physical, chemical and biological processes, operations and reactor configurations commonly using for water quality control; preliminary and operations; discussion of economic and legislative constraints and requirements.
CEE 428, ENSCEN 428	Introduction to Groundwater Hydrology	Undergrad	Courses that include sustainability	Engineering Å» Civil & Environmental Eng., Engineering, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts	Basic principles which govern the flow of water in the subsurface. Development and solution of groundwater flow and contaminant transport equations, in presence and absence of pumping wells, for both confined and phreatic aquifers. Measurement and estimation of parameters governing flow and transport, including methods such as pump tests and moment analysis. Remediation of contaminated groundwater.
EES 496	Major Design Experience - Professionalism	Undergrad	Courses that include sustainability	Engineering Å» Electrical Eng. and Comp. Sci., Engineering	Design principles for multidisciplinary team projects, team strategies, entrepreneurial skills, ethics, social and environmental awareness, and life long learning.
IOE 463, MFG 463	Measure & Design of Work	Undergrad	Courses that include sustainability	Engineering Å» Industrial and Operations Engineering, Engineering	Design of lean manufacturing systems requires knowledge and skills for describing manual work, identifying value and non-value added work elements, designing efficient work equipment and methods, preventing fatigue and related worker health problems and predicting work performance.
MACROMOL 410, BIOMEDE 410, MATSCIE 410	Design & Applications of Biomaterials	Undergrad	Courses that include sustainability	Engineering Å» Macromolecular Science and Engineering, Engineering, Engineering Å» Materials Science and Eng., Engineering Å» Biomedical Engineering	Biomaterials and their physiological interactions. Materials used in medicine/dentistry: metals, ceramics, polymers, composites, resorbable, smart natural materials. Material response/degradation: mechanical breakdown, corrosion, dissolution, leaching, chemical degradation, wear. Host responses: foreign body reactions, inflammation, wound healing, carcinogenicity, immunogenicity, cytotoxicity, infection, local/systematic effects.
MATSCIE 480, MFG 480	Materials & Engineering Design	Undergrad	Courses that include sustainability	Engineering Å» Materials Science and Eng., Engineering	Design concepts. Engineering economics. Various design criteria, processes, and process control. Materials substitution. Competitive design. Case histories. Professional and ethical considerations. Written and oral presentations of solutions to design problems.
MECHENG 235	Thermodynamics I	Undergrad	Courses that include sustainability	Engineering Å» Mechanical Engineering, Engineering	Thermodynamics I: Introduction to engineering thermodynamics. First law, second law system and control volume analyses; properties and behavior of pure substances; application to thermodynamic systems operating in a steady state and transient processes. Heat transfer mechanisms. Typical power producing cycles and refrigerators. Ideal gas mixtures and moist air applications.
MECHENG 335	Heat Transfer	Undergrad	Courses that include sustainability	Engineering Å» Mechanical Engineering, Engineering	Heat transfer by conduction, convection, radiation; heat storage, energy conversion; steady-state/transient conduction heat transfer; thermal circuit modeling; multidimensional conduction; surface radiation properties, enclosure radiation exchange; surface convection/fluid streams over objects, non-dimensional number, laminar, turbulent, thermo-buoyant flow, boiling and condensation; heat exchangers; design of thermal systems, solvers for problem solving/design.
MECHENG 336	Thermodynamics II	Undergrad	Courses that include sustainability	Engineering Å» Mechanical Engineering, Engineering	Description/discussion of thermodynamic power and refrigeration systems; availability and evaluation of thermodynamic properties; general thermodynamic relations, equations of state, and compressibility factors; chemical reactions; combustion; gaseous dissociation; phase equilibrium. Design and optimization of thermal systems.
NAVARCH 331	Marine Engineering I	Undergrad	Courses that include sustainability	Engineering Å» Naval Arch. & Marine Eng., Engineering	Diesel engines, steam turbines, and gas turbines as marine prime movers. Thermodynamic cycles, ratings, matching to loads. Engine-propeller matching. Mechanical transmission of power to marine loads. Principles of fluid system design. Introduction to heat transfer and heat exchangers.
ENSCEN 211, NERS 211	Introduction to Nuclear Engineering and Radiological Sciences	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	Introduction to Nuclear Engineering and Radiological Sciences: This course will discuss different forms of energy, the history of nuclear energy, the fundamentals of fission and fusion nuclear power, radiological health applications, and electromagnetic radiation in the environment, current topics in the media such as radon, radioactive waste, and nuclear proliferation will also be covered.
NERS 250	Fundamentals of Nuclear Engineering and Radiological Sciences	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	Technological, industrial and medical applications of radiation, radioactive materials and fundamental particles. Special relativity, basic nuclear physics, interactions of radiation with matter. Fission reactors and the fuel cycle.
NERS 320	Problems in Nuclear Engineering and Radiological Sciences	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	This course introduces junior-level NERS students to several different standard physical problems in nuclear engineering and radiological sciences, together with basic mathematical and numerical methods for solving the problems. In the course each different physical problem will be introduced, mathematical equations for the problem will be derived, and solution techniques will be presented to solve the equations. The course is meant to prepare students for more advanced senior-level NERS courses.
NERS 421	Nuclear Engineering Materials	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	An introduction to materials used in nuclear systems and radiation effects in materials (metals, ceramics, semiconductor, organics) due to neutrons, charged particles, electrons, and photons.
NERS 441	Nuclear Reactor Theory I	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	An introduction to the theory of nuclear fission reactors including neutron transport theory, the P1 approximation, diffusion theory, criticality calculations, reactor kinetics, neutron slowing down theory, and numerical solution of the diffusion equation.
NERS 442	Nuclear Power Reactors	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	Analysis of nuclear fission power systems including an introduction to nuclear reactor design, reactivity control, steady-state thermal-hydraulics and reactivity feedback, fuel cycle analysis and fuel management, environmental impact and plant siting, and transient analysis of nuclear systems. A semester-long design project of the student's choice.
NERS 472	Fusion Reactor Technology	Undergrad	Courses that include sustainability	Engineering Å» Nuclear Eng. and Radiological Sciences, Engineering	Study of technological topics relevant to the engineering feasibility of fusion reactors as power sources. Basic magnetic fusion and inertial fusion reactor design. Problems of plasma confinement. Energy and particle balances in fusion reactors, neutronics and tritium breeding, and environmental aspects. Engineering considerations for ITER and NIF.

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CEE 365	Environmental Engineering Principles	Undergrad	Courses that include sustainability	Engineering, Engineering & Civil & Environmental Eng.	An introduction to mass balance modeling of contaminant fate, transport and removal in the environment; commonly used reactor configurations for water and air quality control; partitioning of contaminant types and sources; regional and global contemporary environmental issues.
LAW 405	Environmental Law Practicum	Undergrad	Courses that include sustainability	Law	Environmental law is like a Russian nesting doll: inside the outer body of federal and state statutes is an entire body of federal and state administrative regulations and procedures, and inside that are federal and state guidance documents, cleanup criteria, risk standards, and inter-agency Memoranda of Understanding. Keep opening to see the body of state and federal environmental administrative decisions, and at last is the individual agency representative, armed with powerful discretion. The environmental law practitioner must open up the nesting doll to see all these components in order to effectively handle cases and counsel clients. In this course students will gain an understanding of all these parts, and apply them to issues and fact patterns based on actual cases. Students will review and evaluate administrative orders, permit applications and denials, and other agency action scenarios. Students will visit sites of actual agency action, prepare research memoranda, and evaluate client options. Students will learn how to work with environmental professionals and consultants in order to process and apply technical and scientific standards to a case. The class will culminate in a mock contested case hearing based on an actual dispute, for which the students will develop case theories, practice witness preparation, strategize on the use of exhibits, dispositive motions, conduct direct and cross examinations, make and respond to evidence objections, and prepare written closing arguments including proposed findings of fact and conclusions of law. Throughout the semester we will obtain insights from guest speakers from agencies, the legislature, interest groups, and environmental consultants and scientists. Students will also gain an understanding of the changing regulatory landscape by analyzing and discussing current legislative and administrative initiatives at both the state and federal levels, and important case law developments involving agency action, discretion and enforcement.
LAW 483	Oil and Gas Law	Undergrad	Courses that include sustainability	Law	The BP oil spill. The Keystone XL pipeline. Hydraulic fracturing (fracking) of wells. Gas prices up. Gas prices down. In the last few years, the headlines have been filled with stories about oil and natural gas. Production in the U.S. is rising. After years of decline, domestic production of crude oil could increase by as much as 42% by 2035, according to the U.S. Energy Information Administration. Meanwhile, domestic production of natural gas is expected to make the U.S. a net exporter rather than a net importer within ten years. What is the legal framework governing the production, transportation, and use of these hydrocarbons? And how does that legal framework affect the economy and the environment? This seminar explores the intersection of energy and environmental policy in the context of oil and gas law. We will begin by reviewing the traditional law of property interests in oil and gas, conveyances, and leases. We will then examine select legal and policy issues involving the drilling and completion of wells (including the technique of hydraulic fracturing), offshore development, transportation through pipelines, refining, and energy use. As time allows, we will also consider the international context.
LAW 492	the Practice of Renewable Energy Law	Undergrad	Courses that include sustainability	Law	n/a
ENVIRON 398	Environment Internship Program	Undergrad	Courses that include sustainability	Literature, Science, & Arts	Undergraduate students, under the guidance of a faculty advisor, participate in an internship relevant to their field of study. Undergraduate students can receive 1-3 credits for internships. See the Program in the Environment in 1120 Undergraduate Science Building for Internship Guidelines.
GEOG 201	Introduction to Environmental Science and Geography	Undergrad	Courses that include sustainability	Literature, Science, & Arts	This course emphasizes the scientific processes and principles behind global environmental problems. Topics include global biogeochemical cycles, human population, ecosystem management, biogeography, ecological restoration, soil-water-air pollution, environmental health, and energy resources.
UC 275	Global Intercultural Experience for Undergraduates	Undergrad	Courses that include sustainability	Literature, Science, & Arts	Global Intercultural Experience for Undergraduates (GIEU) is an interdisciplinary experiential introduction to intercultural learning that prepares diverse undergraduate students from various colleges for field experience interactions, and then helps students bring these experiences back to campus in socially and academically productive ways. It is a series of concentrated seminars of orientation, debriefing, and symposium.
AAS 304	Gender&Immigr	Undergrad	Courses that include sustainability	Literature, Science, & Arts & Afroamerican and African Studies, Literature, Science, & Arts	Gender and Immigration: Identity, Race, and Place --- This course examines crucial questions related to how mobility, border-crossing, dislocation, and displacement are gendered and are given cultural and political meanings in the era of globalization and transnationalism. We carefully examine the embedded meanings and histories of the terms, "diasporas," "transnationalism," and "globalization," and their usefulness in analyzing social constructions of gendered-identities, race, caste, and ethnicity, and reproduction, socialization, and health.
AAS 323	Blk Feminist Thought	Undergrad	Courses that include sustainability	Literature, Science, & Arts & Afroamerican and African Studies, Literature, Science, & Arts	Black Feminist Thought and Practice --- This course explores the production and practice of black feminist theory in 20th century America. It examines the written work and the activism of African American women and looks at the ways their theory and practice historically intersect around questions of race, class, sexuality, nationality and gender. Using both primary and secondary sources, the course is also concerned with the various articulations of black feminism (e.g. womanism, critical race feminism, transnational black feminism, hip hop feminism, etc.).
AAS 330, RCSSCI 330	Urban and Community Studies I	Undergrad	Courses that include sustainability	Literature, Science, & Arts & Afroamerican and African Studies, Literature, Science, & Arts	This course is designed to help students develop historical perspectives and analytical frameworks that will guide them as they study and work in urban communities. Focusing on the collective experience of African Americans in the second half of the twentieth century, we will conduct an interdisciplinary investigation into the processes of community formation and social change impacting contemporary urban life. Course texts therefore include historical studies, urban sociology, social work, autobiography, ethnography, community studies, and film. We will begin with a review of the various meanings and uses of the idea of "community," moving next to a brief consideration of the historical development of American cities. Then we will explore the processes of African American migration and urbanization, including the exploration of specific urban areas and their dynamics of community formation. Finally, we will examine case studies of community organizing, leading us to consider broad questions concerning our understanding of contemporary urban communities, the challenges they face, and the prospects for engaged social action. Our guiding concern throughout the academic term will be the relationship between universities and their surrounding communities--including the historical expressions, contemporary realities, and future prospects of this relationship. This is the one required course for the Urban Studies minor.
AAS 426	Urban Redevelopment & Social Justice	Undergrad	Courses that include sustainability	Literature, Science, & Arts & Afroamerican and African Studies, Literature, Science, & Arts	This course explores cities in contemporary Africa through the lens of architecture and the built environment, informal economies and survivalist strategies, art and culture, social justice and citizenship. There is an unfortunate tendency in journalistic, scholarly accounts to portray cities in Africa as examples of distressed, distorted, truncated, or failed urbanism. This view that "cities in Africa just don't work" is a fairly widespread perception that has embedded itself in popular culture. Rather than treating cities in Africa as undifferentiated places of socio-economic malaise, famine and war, infrastructural failure, and service breakdown, the course seeks to understand the complexity of processes at work that produce cities in Africa today. The course focuses the multiple ways that cities actually do work in Africa, but perhaps in ways that are invisible to planners, experts, journalists, and travelers.

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AAS 443, WOMENSTD 443	Race, Gender&Health	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Afroamerican and African Studies, Literature, Science, & Arts	The Pedagogy of Empowerment will explore race, gender, health and activism in the context of HIV/AIDS in United States Black communities. Through this two-tiered course, students will cultivate strong background knowledge of HIV in Black communities, and explore issues of accountability, apathy, and activism as they pertain to HIV prevention. The course will explore the multifaceted dimensions of the HIV/AIDS epidemic in Black communities including: its history and epidemiology; gendered dynamics of HIV prevention; intersectionality, HIV infection, and stigma; homophobia and the politics of inclusion and exclusion; and various community responses. Students will use what they learn about the context of the epidemic to critically analyze chosen HIV prevention interventions, and explore the intersection of academia and activism. All students will learn an HIV education module designed by Professor Nesha Haniff. As an exercise in praxis, each student will be required to use and experience this HIV prevention module in a community of her or his choice. Be warned that the community of preference should be outside the University of Michigan. The theoretical text for this class will be Paulo Freire's Pedagogy of the Oppressed. We will also examine other approaches to empowerment like The Barefoot College in India and Yunus Mohamed's Grameen Banking system.
AAS 462	African Health	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Afroamerican and African Studies, Literature, Science, & Arts	Globalization and African Health --- The course will investigate the two-way relationship between globalization and African health. Topics include: globalization and informalization; urbanization and health; the influence of international property rights and access to pharmaceuticals; the impact of international trade on African incomes; the relationship between international debt, World Bank and IMF conditionality and the health of Africans; the impact of FDI on African livelihoods; the influence of commodity chains and global industries on Africa's standard of living; how the shifting global climate has affected rainfall patterns; agricultural production and the incidence of malnutrition and famine; and the relationship between the health of Africans and new global diseases.
AAS 409, ANTHRCUL 408	Maternal/Child Health and Environmental Pollution in Africa	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Afroamerican and African Studies, Literature, Science, & Arts, Literature, Science, & Arts » Anthropology	This course focuses on the effects of environment and environmental pollution on the health of women and children in several sub-Saharan African countries. Selected readings in medical anthropological, public health, and environmental pollution as well as films examining connections between health, environmental factors, and development are discussed.
AMCULT 311	Topics in Ethnic Studies	Undergrad	Courses that include sustainability	Literature, Science, & Arts » American Culture, Literature, Science, & Arts	Green Indigeneity
AMCULT 348, HIST 346	American Radicalism	Undergrad	Courses that include sustainability	Literature, Science, & Arts » American Culture, Literature, Science, & Arts	Starting with abolitionism and early women's rights, this course examines 150 years in the development of a modern Left in the U.S., highlighting labor-based radicalism as well as militant protest by people of color, feminists, antiwar activists, disaffected youth, and other liberation advocates of the latter 20th century, culminating with recent "anti-globalization" activism.
AMCULT 371, AMCULT 371, WOMENSTD 371	Women in American History Since 1870	Undergrad	Courses that include sustainability	Literature, Science, & Arts » American Culture, Literature, Science, & Arts	This course will examine how social constructions of gender, race, class and sexuality have shaped women's lives in the U.S. from the Civil War to the present, and how some women have pushed at the boundaries of those constructions through, for example, changing patterns of work, leisure, education and intimacy; through political activism; through labor organizing; through involvement in a variety of social movements; and through popular culture. We will emphasize the diversity women's historical experiences by region as well as by social category, and will situate those experiences in the larger contexts of social, economic, and political change on local, national, and even global levels.
AMCULT 369, HISTORY 369	Modern American Culture	Undergrad	Courses that include sustainability	Literature, Science, & Arts » American Culture, Literature, Science, & Arts, Literature, Science, & Arts » History	This course is designed as an intensive historical survey of U.S. mass culture over the past two centuries. We will begin the semester with the very first œcultural industries of the 1830s and 40s (e.g., P.T. Barnum's traveling exhibitions and blackface minstrel shows), and then follow the expansion and evolution of U.S. commercial entertainment through the dawn of electronic media and globalization. Weekly topics may include the reinvention, commodification, and distribution of pre-industrial vernacular forms; the rise of corporate structures and syndication; the consolidation of new publics; the mechanics of promotion; the politics of production and consumption; and the manifold impacts of U.S. mass culture, both at home and abroad. Our scope will be deliberately broad and comparative, cutting across museum exhibitions, theater, dance, literature, film, radio, television, and the internet. We will also make extensive use of 19th- and 20th-century primary source materials (playbills, newspaper reviews, trade periodicals, music and video clips) in order to gauge the shifting meanings of mass culture according to historical context.
ANTHRARC 480	Arch Pract Res Tech	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Practica in Archaeological Research Techniques --- This course provides students with theoretical background and hands-on experience in the documentation and analysis of a range of archaeological remains. The course is subdivided into units or sections, focusing on some combination of the following: the analysis of ceramics, lithics, fauna, botanical remains, soils, archaeological photography, mapping, and drafting.
ANTHRBIO 201	Introduction to Biological Anthropology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Study of human evolution with emphasis on genetic evolutionary process. Man's evolutionary history as evidenced by fossil remains and present racial variation in light of modern evolutionary theory.
ANTHRBIO 364	Nutrition & Evolution	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Study of the evolutionary basis of contemporary nutritional patterns, the short and long-term effects of industrialization on human biology during development and adulthood.
ANTHRBIO 467	Human Behavioral Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	This course considers the anthropological significance of recent advances in natural selection theory. Particular topics include: cooperation, reciprocity, inclusive fitness, sexual selection, mating systems, and parental investment. Students will read the primary scientific literature to learn how anthropologists test evolutionary hypotheses in varied geographic and cultural contexts (for example, Ache hunter-gatherers of Paraguay, Dogon agriculturalists of Mali, Kipsigi pastoralists of Kenya, 19th century Europeans, and contemporary North Americans). Natural selection theory will also be used to probe the field of human reproductive ecology, with emphasis on the demographic transition, historical demography, the evolution of menstruation, and female fecundability. In addition to exams, students will write a term paper in which they hone their ability to discriminate among alternative view points using both qualitative and quantitative data.
ANTHRBIO 474	Hominid Origins	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Hominid Origins --- This course is about the origin of the human species and the adaptations and life history of the earliest human ancestors before Homo. It examines the ancestry of the hominids, the various theories of their origin, and aspects of australopithecine evolution such as their history, locomotion, behavior, adaptations, and taxonomy.
ANTHRCUL 328	Globalizing Consumer Cultures	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Globalizing Consumer Cultures --- This course presents an anthropological perspective on consumer culture. Topics include: classic oppositions between gift exchanges vs. commodity societies; analyses of advertising, branding and retail; and ethnographic descriptions of increasingly commodified lives in places as far flung as Hungary, India, Argentina, England, Sweden and Nepal as well as in the U.S.
ANTHRCUL 330	Culture, Thought and Meaning	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Culture, Thought and Meaning
ANTHRCUL 332	Exch Commod&Money	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Exchange, Commodities, and Money --- Introduces core problems in social anthropology, centering on how the organization of societies affects the lives and experiences of those who live in them. Topics covered may include material possessions and values, gifts and commodities, family life, and the sense of personal identity.
ANTHRCUL 334	Anthropology and Development	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	œ The class examines what "development" means from a range of perspectives, including those of community members, anthropologists, and development professionals. The goal is to understand how their different attitudes, beliefs, and political concerns affect how development projects are implemented and interpreted.
ANTHRCUL 439	Economic Anthropology and Development	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Introduces students to the practical and theoretical problems raised by the modernization of rural, village-based tribal and peasant economies and the urbanization and industrialization of local and national communities of the non-western world. Focuses on the rapid and exciting social and economic transformation of contemporary Third World countries of Africa, Asia, Middle East, Latin America and the Caribbean.

Course Number	Title	Level	Level of Sustainability	School/College	Description
ANTHRUCUL 408, AAS 409	Maternal/Child Health & Environment - Africa	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts, Literature, Science, & Arts » Afroamerican and African Studies	This course will focus on the effects of the environment and environmental pollution on the health of women and children in several sub-Saharan African countries. Selected readings in the medical anthropological, public health, and environmental literature as well as films examining connections between health, environmental factors, and development will be discussed. Specific health problems covered will include the effects of wood smoke pollution on infant and child health, the effects of mining, specifically gold mining on the health of women and children, the use of pesticides and women's reproductive health, waterborne diseases and disease vectors such as guinea worm, automobile emissions and respiratory health problems, and waste disposal and contagious disease.
ASTRO 142	From the Big Bang to the Milky Way	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Astronomy, Literature, Science, & Arts	This course will trace our progress in understanding the nature of the Universe from the early Greeks to today, with emphasis on our current understanding based on Einstein's relativity. The Big Bang Theory will be presented and origin of matter will be traced from the formation of atoms, to the formation of the first stars, to the build-up of galaxies such as the Milky Way. Dark energy and the ultimate fate of the universe will also be discussed in the context of the recent results from space satellites concerning the cosmic microwave background radiation that fills the universe and the large scale distribution of galaxies that form the cosmic web.
BIOLOGY 107	Evolution of Life	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	Evolution of Life --- This course provides an introduction to biological evolution. We consider: the evidence for evolution; an overview of the evolution of cells, organisms, and viruses; evolutionary themes of natural selection, chance, and cooperation; and the consequences of an evolutionary world view for understanding disease, biological diversity, and human culture.
BIOLOGY 108	Introduction to Animal Diversity	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	This course will introduce students to the amazing diversity of animals in our world. We will discuss how animals within this diversity manage to survive, function, reproduce, and behave in their natural environment. Meanwhile, we will explore interesting questions that scientists ask about animals. We ultimately want students to leave this course with
BIOLOGY 125	Biotech & Society	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	This course provides an introduction to the principles and practices involved in the genetic manipulation of organisms. Topics include animal, plant, microbial, and medical biotechnology. The aim is to help students understand the biological basis for current biotechnology activities, as well as to point out ethical and social concerns that arise from these activities.
BIOLOGY 130	Animal Behavior	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	This course is an introduction to the behavior of animals in their natural environment. Students gain a background in evolution and learn how to use natural selection to understand why animals behave the way they do.
BIOLOGY 171	Introductory Biology: Ecology and Evolution	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	BIOLOGY 171 is a one-term introductory course in ecology and evolutionary biology that imparts factual and conceptual knowledge on the origin and complex interactions of the earth's biodiversity and ecosystems. Its goal is to help students to develop scientific hypothesis-testing, critical-thinking and writing skills. BIOLOGY 171 is part of a two-semester introductory unit that includes BIOLOGY 172 and 173.
BIOLOGY 172	Introductory Biology - Molecular, Cellular, and Developmental	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	Introductory Biology - Molecular, Cellular, and Developmental --- BIOLOGY 172 is a one-term introductory course in molecular, cellular, and developmental biology that imparts factual and conceptual knowledge on how cells, organs, and organisms work. One of its goals is to help students develop scientific hypothesis-testing, critical-thinking and writing skills. BIOLOGY 172 is part of a two-semester introductory unit that includes BIOLOGY 171 and 173.
BIOLOGY 207	Introductory Microbiology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	The lectures will trace the history of microbiology, microbial growth and metabolism, microbial diversity, and the importance of microbes in the environment, industry and medicine. The laboratory sessions introduce microscopy, aseptic technique, staining, and the isolation, culture and identification of microbes from the local environment.
BIOLOGY 230	Introduction to Plant Biology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	This course presents a broad, integrated overview of plant biology including economic and environmental aspects. The main themes are plant diversity, structure, function, development, and ecology.
BIOLOGY 255, ENVIRON 255	Plant Diversity	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	This course examines plant diversity by groups, ranging from algae and nonvascular plants through primitive vascular plants and culminating in flowering plants. Using an evolutionary perspective, it treats plants as organisms and emphasizes the innovations and structural adaptations of the various plant groups as well as life history strategies. Weekly field trips allow exploration of local natural areas.
BIOLOGY 256	Animals Functioning in Environments	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	Discover intriguing research being done by environmental physiologists, ecological morphologists and evolutionary physiologists! Learn about applications to environmental health and animal conservation. Investigate how evolutionary history influences animal form and function. Learn how physiological and functional patterns relate to the diversity of Earth's habitats. Learn from human, vertebrate, and invertebrate examples.
BIOLOGY 288	Animal Diversity	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	Animal Diversity --- Biology 288 will provide biology majors with a survey of the animal phyla in the context of discussions of major issues in ecology and evolution. Students will see the diversity of behavior, mating systems, life history, and diverse interactions.
BIOLOGY 482	Limnology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts	*BIOSTATION* This course introduces the fundamentals of aquatic ecology (with an emphasis on lakes) from an ecosystem-level approach. General limnological principles as well as physical, chemical and biological parameters of lakes will be studied. Biological investigations include an introduction to the ecology and taxonomy of the algae, zooplankton, macroinvertebrates, macrophytes, and fishes. Field studies include a comparative lake survey in which students will gain experience in field sampling, laboratory analysis of samples, statistical analysis and interpretation of data for several types of lakes.
BIOLOGY 281, ENVIRON 281	General Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Biology, Literature, Science, & Arts » Program in the Environment	The course introduces the basic concepts and principles of ecology as applied to the study of individuals, populations, and communities of both plants and animals.
CHEM 474	Environmental Chemistry	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Chemistry, Literature, Science, & Arts	This course is the study of natural processes in the atmosphere, hydrosphere, and lithosphere, as well as how mankind alters these systems. Natural cycles in the environment, perturbations due to human activity, steps being taken to mitigate these effects, and the impacts on human health and climate will be covered.
COMM 413, ENVIRON 413	Environmental Communication	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Communication Studies, Literature, Science, & Arts	This course serves as an introduction to the theory and practice of environmental and science communication. Topics include media depiction's of environmental issues, the role of the media in influencing public opinion and policy actions, expert environmental communication by scientists and policy-makers, and theories that guide effective strategic environmental communication. We will engage with many of the critical environmental issues of our day, including climate change, fracking, support for renewable energy initiatives, and many more.
COMM 460	History of Technology in Modern Culture	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Communication Studies, Literature, Science, & Arts	This interdisciplinary seminar explores the cultural history of technology and communication by tracing the emergence of, and reception to, selected technologies from the 19th century to the present. It pays critical attention to unique and recurring problems and opportunities associated with communication and technical innovation in the modern world.
COMM 466	Digital Politics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Communication Studies, Literature, Science, & Arts	Global Digital Politics --- This CAPSTONE seminar explores important ways in which digital media and internet infrastructure are shaping and constraining participation and organizing in developing and emerging countries. The course introduces comparative politics and the comparative method to communication and media studies students, with rich case studies to understand new forms of collective action.
COMM 470	Minority Self-Rep	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Communication Studies, Literature, Science, & Arts	Telling Our Own Stories: Minority Self-Representation in the Media --- This course explores media narratives and representations of identity and culture told from a minority point of view, considering questions of race/ethnicity, sexuality and gender. The course examines how these media stories are told, what topics/issues they address, and what alternative views of American identity and society they provide.
EARTH 100	Coral Reefs	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Coral Reefs is an in-depth tour of the biological and physical processes active in modern reef systems to provide a detailed understanding of the ecology of the individual organisms and the complex nature of their interactions within the reef community. Evolution of the reef community is examined, ranging from the crude framework structures formed over one billion years ago by primitive algae to luxuriant and diversified reefs of the modern-day oceans. The implications of man's intervention in the Earth's hydrosphere and atmosphere on the character of future reef communities are also considered.

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EARTH 107	Volcanoes and Earthquakes	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	The Earth in action; geography of earthquakes and volcanoes and catastrophic events in historic times; size and frequency of occurrence of earthquakes and volcanic eruptions; the products of volcanism, volcanic rocks, and volcanic and geologic activity through geologic time; volcanic exhalations and the evolution of the Earth's atmosphere and oceans; the relationship of earthquakes and volcanoes to plate tectonics and the internal dynamics of the Earth; and volcanism and geothermal energy, man-made earthquakes, and earthquake prediction and control.
EARTH 108	When Earth Attacks: The Science Behind Natural Disasters	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Natural disasters, such as earthquakes, volcanic eruptions, tsunamis, landslides, floods, hurricanes, and tornadoes, can lead to thousands of fatalities and billions of dollars in economic damage. This course explores the science behind natural disasters, concentrating on our ability, or inability, to predict them, and how this affects public perception and policy. The course also addresses how natural disasters can lead to changes in both science and public policy.
EARTH 109	Water and Society	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course will present an overview of problems encountered through the unwise use of water resources and the resultant impact on society through the analysis of case studies. An introduction to the hydrological cycle and principles of surface and groundwater hydrology will be provided.
EARTH 112	Life in Extreme Environments	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Life inhabits nearly every environment on Earth, from boiling hot springs to the bottom of the ocean to freezing subglacial lakes. This course surveys the bizarre life forms that call these environments home, explores adaptations to extreme physical and chemical conditions, and highlights biotechnological resources from extreme life.
EARTH 115	The Emerald Planet	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This minicourse explores the major events in the co-evolution of plants and the Earth. Topics include: how plants moved onto land, the rise of the first forests, the invention of flowers and their impact on animals, and how plants bring about and respond to environmental change.
EARTH 120, ENVIRON 120	Geology of National Parks & Monuments	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This is an introductory course that uses the National Parks (Hawaii, Yellowstone, Crater Lake, Yosemite, Grand Canyon, Zion, Pt. Reyes, Death Valley, Grand Teton, Rocky Mtn, Glacier and Pictured Rocks) to explore the geological history of the Earth, and specifically the tectonic evolution of the North American continent. Topics include plate tectonics, global volcanism, large explosive volcanic eruptions, the age of the Earth, the history of life (fossil record), meteorite impacts, earthquakes, mountain building, the origin of the Great Lakes, and climate change throughout Earth history.
EARTH 146	Plate Tectonics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Two hundred million years ago the Earth's continents were joined together to form one gigantic super-continent, called Pangea. Plate tectonic forces broke Pangea apart and caused the continents to drift. We study the evidence for plate tectonics and the large-scale dynamics of the Earth's interior that is responsible for mountain building, earthquakes faulting, volcanic eruptions, changes in Earth's magnetic field and much more.
EARTH 147	Natural Hazards	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This first-year seminar examines the geologic origin, as well as economic and societal impact of natural hazards such as earthquakes, volcanoes, landslides, floods, tsunamis, climate change, and meteorite impacts through lectures, discussion, student presentations, and research projects.
EARTH 148	Seminar: Environmental Geology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This seminar examines interactions between people and their physical environment through case histories. We discuss several environmental problems, including natural hazards, water resources, nuclear waste disposal, and geologic aspects of environmental health. Emphasis will be given to current water issues.
EARTH 151	The Ice Ages: Past and Present	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Explores the characteristics of the Earth's climate system and how the various components of that system operate to produce times when extensive ice sheets cover large parts of the Earth's surface. The role of each of the major components of the climate system will be discussed in detail. These include the ice sheets themselves, the astronomical inputs, the oceans, the atmosphere, and the movement of the continental and ocean boundaries. Reconstructions of past climatic conditions are presented and discussed in terms of how they are developed, what they can tell us about climatic extremes, and how they can be used to test the models that simulate modern climate patterns. The long-term climate change associated with the most recent ice age is then contrasted with more rapid climate oscillations, particularly the climatic warming which has been associated with the recent large increase in atmospheric "greenhouse gases."
EARTH 154	Ocean Resources	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	The oceans provide many resources, including food, recreation, energy, and minerals. This course examines scientific principles behind these resources, as well as the conflicts that arise because of their utilization (the ocean as food resources vs. overfishing; development of beaches and marinas vs. preservation of wetlands; etc.).
EARTH 156	Coral Reef Dynamics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	The biology and ecology of modern reefs are studied, together with the evolution of the reef community and its composition over geologic time. The class investigates the interaction between the organisms living in association with coral reefs. It also explores the ways in which our species affect the reefs and both directly and indirectly through climate change.
EARTH 175, GEOSCI 175	Microbial World	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course examines how microorganisms shape the world around us, both throughout the Earth's history and today. Major topics include the origin and evolution of life, the interplay between microbes and the environment, the roles microbes play in global warming, and applications of microbiology in biotechnology and energy.
EARTH 205	How the Earth Works: the Dynamic Planet	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	An integrated look at the dynamic Earth, with an emphasis on processes involved in its formation 4.56 billion years ago, the early development of its atmosphere, oceans and crust, and the subsequent evolution of its continents and ocean basins.
EARTH 305	Earth's Surface & Sediments	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Properties of sediments and their origin, transportation, deposition, lithification, and diagenesis followed by ecology and environmental analysis, paleoecology, facies analysis, and an introduction to stratigraphic methods and principles.
EARTH 310	Geochemistry of the Solid Earth	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course addresses the evolution of the solid Earth through magmatic and metamorphic processes. Major themes addressed are: the compositional and mineralogical stratification of the Earth and its early history (accretion, core formation, magma oceans); formation of oceanic crust at spreading ridges; hydrothermal alteration of oceanic crust and subsequent metamorphism during slab subduction; origin and evolution of continental crust at subduction zones; regional metamorphism during subduction and continent-continent collision; recycling of ancient slabs and intraplate volcanism; interaction of "hot spots" with spreading ridges and continents; large-volume silicic volcanism; large-volume basalt volcanism; continental crust formation throughout Earth history and long-term secular evolution of the mantle.
EARTH 311	Geology of Michigan	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course is suitable for students with a limited background in science and geology. Basic principles of geology are outlined in the course and used to explore the 4 billion years of geologic evolution of the Upper Great Lakes region by way of lectures and interpretation of geologic maps.
EARTH 314	Global and Applied Geophysics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course covers the use of geophysical methods for exploration of the shallow subsurface, as is used in oil and mineral exploration, search for water, and environmental problems. We discuss exploration techniques based on gravity, electromagnetics and elastic wave propagation. Lab exercises include discussion and hands-on experience with data collection techniques (using geophysical equipment on campus), data interpretation, and computer modeling.
EARTH 325, ENVIRON 325	Environmental Geochemistry	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course deals with the geochemistry of our environment. It focuses on the geochemistry of the lithosphere, hydrosphere and atmosphere and the ways in which they affect the biosphere. Applications of these principles to present-day problems in environmental geochemistry are discussed.
EARTH 331	Climate Change	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course examines the physical and chemical processes influencing Earth's climate and the methods of quantifying past and present climate change. Emphasis is placed on understanding the mechanisms of climate change from ice ages through the near future. The evidence of human-caused changes in climate is also discussed. Students with interests in global change and the environment are encouraged to enroll. A background in college science is not required.
EARTH 351	Earth Structure	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Geological structures of the lithosphere and introduction to global tectonics. Three hours lecture, one laboratory weekly. Topics include: folding, faulting, stress, strain, rheology, deformation mechanisms, whole-earth structure, plate tectonics.
EARTH 408	Intro GIS Earth Sci	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Introduction to GIS in the Earth Sciences --- This course provides an understanding of Geographic Information Systems and their application in the earth sciences. Through lectures and lab exercises students are exposed to GIS theory, applications and software.
EARTH 417	Geology of the Great Lakes	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Geologic history of the late-glacial and post-glacial Great Lakes of North America, with emphasis on evaluation of evidence. Related topics such as lake circulation, bedrock setting, and physical environment of sedimentation, and paleoclimate records are examined.

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EARTH 418	Paleontology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Introduction to the principles, methods of analysis, and major controversies within paleontology; familiarization with the fossil record and its use in problems involving evolutionary biology, paleoecology, and general Earth history.
EARTH 422	Prin of Geochem	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Principles of Geochemistry --- This course explores how geochemical methods can unravel and provide insight into the origin and chemical evolution of the earth and its parts (core, mantle, crustal rocks). Topics covered include: stable isotope and trace element analysis; radioactive age dating; hydrothermal solutions, and metamorphic and igneous systems.
EARTH 435	Fld Stdy-Min&Petrol	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Field Studies in Mineralogy, Petrology, and Geochemistry
EARTH 436	Field Studies in Stratigraphy, Paleontology, and Sedimentology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Field Studies in Stratigraphy, Paleontology, and Sedimentology
EARTH 437	Evolution of Vertebrate	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Lectures and laboratory exercises on the anatomy, ecology, and phylogeny of fishes, amphibians, and reptiles in the fossil record, with emphasis on adaptation and evolution.
EARTH 440	Field Course in Geology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	In this broad, in-depth field course, students are trained to recognize distinct lithological units and their 3-D relationships. Mapping projects include deformed and faulted sedimentary, regional metamorphic, and igneous complexes. Digital mapping techniques and modern geophysical tools supplement traditional field observations.
EARTH 442, ENVIRON 442	Earth Surface Processes & Soils	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Study of processes resulting in landforms on the Earth's solid surface and the formation of soils on these landforms. Emphasis includes present-day processes as well as the evolution of landforms over geologic time. Several required field trips will examine landforms and processes in southern Michigan.
EARTH 445, GEOSCI 445	Biogeography	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course covers geographic aspects of ecological and evolutionary processes of populations, communities, and lineages. The course investigates the physical and biological processes shaping geographic patterns of species richness, community structure, and ecosystems over the earth and at regional and local scales, as well as the geographic structure of populations and species. Geohistorical dimensions of these topics include dispersal and vicariance, speciation, and extinction, and macroecological and macroevolutionary trends over earth history. Examples and case studies cover the full range of organisms and environments.
EARTH 449	Marine Geology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This class provides a survey of marine geology. Subjects include: the morphology and evolution of the ocean basins; relationships among magmatic, tectonic, and hydrothermal processes at mid-ocean ridges; subduction zone processes; the development of continental margins; and the sources, distribution, and evolution of deep sea sediments.
EARTH 451	Earth Structure: Introduction to Structural Geology & Tectonics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Description and interpretation of geological structures in the Earth's crust and introduction to global plate tectonics. Topics covered are: mechanics, stress, strain and deformation; hand-specimen and field description of geological structures; the kinematics and dynamics of folding and faulting; flow of rocks (rheology); introduction to dislocation theory; microstructural analysis; principles of plate tectonics; tectonic evolution of selected regions. The course is aimed at those with an interest in geology beyond the introductory level, as well as students who want a basic understanding of the outer Earth's physical properties.
EARTH 452	Paleoceanography	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course focuses on global earth system changes over a wide range of spatial and temporal scales. Major climatic events occurring over the last 60 million years and their interaction with biota, ocean, and atmospheric chemistry and sediments are examined.
EARTH 455	Determinative Methods in Mineralogical and Inorganic Materials	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Determinative Methods in Mineralogical and Inorganic Materials
EARTH 467	Stratigraphy & Basin	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Stratigraphy and Basin Analysis --- This course focuses on continental and marine depositional environments and on sedimentary basin filling processes, including an overview of differences between various tectonic settings. Case studies will be drawn from
EARTH 478	Geochemistry of Natural Waters	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	chemical compositions of natural waters, emphasizing both chemical and biogeochemical processes operating near Earth's surface; equilibrium vs. kinetic controls on chemical weathering; solute sources and mass balances in watersheds, groundwater, and river/ocean mixing zones. Hands-on field and lab experience provides training in methods of applied geochemistry.
EARTH 495	Research Methods NS	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Methods in Research for Natural Sciences --- This course covers the approaches to conducting research in the natural sciences, including the tools and methods of research; the processes for performing research; the mechanisms for communicating research re
GEOG 472, UP 572	Transportation and Land Use Planning	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	This course explores the interrelated systems of urban transportation and urban land use to discover principles and ideas that can be useful in developing plans that affect the two. The course covers four broad areas: Transportation Planning History: What assumptions and approaches have guided domestic transportation planning? How do transportation planning's roots and traditions affect current practice? In what ways did transportation planning and technologies interact to produce evolving city forms? Transportation and Land Use Theory: What frameworks have been developed to understand the interrelationships between transportation and land use, and how might these affect how we view potential transportation planning alternatives? Transportation Planning Techniques: Formal approaches to modeling domestic land use and transportation systems in the past few decades. We explore these approaches as well as their limitations. Urban Transportation Policy: Alternative definitions of the transportation problem can lead to different directions for policy. We explore various contemporary transportation planning concerns and approaches to dealing with them.
EARTH 411, AOSS 411	Cloud & Precipitation Processes	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Engineering » Atmospheric, Oceanic & Space Sciences, Engineering	The special nature of water substance; nucleation of phase changes in the free atmosphere; the structure and content of clouds; the development of physical characteristics of precipitation; and the dynamics of rain systems.
EARTH 206, ENVIRON 206	How the Earth Works: The Water Cycle & Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts » Geological Sciences	This course describes behavior of earth materials in the surficial environment. Water is the main transport agent in the geological cycle; its unique properties and exchange rates among oceans, lakes, rivers, and groundwater are one focus. Interaction between water reservoirs and physical and chemical weathering of soils, sediments, and rocks also are discussed. Impact of humans on the surficial environment is a unifying theme because we can affect hydrologic and geochemical cycles. No special background required. Two lectures per week. Evaluation based on exams and participation.
EARTH 119, GEOSCI 119, ENVIRON 119	Introductory Geology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts » Geological Sciences, Literature, Science, & Arts » Program in the Environment	A basic single-term course in introductory geology concentrating on the evolution of the Earth in physical and chemical terms. Reference to the interaction of the external biosphere/atmosphere/hydrosphere with the earth's interior is an essential component of the course. Topics covered include: plate tectonics; continental collision and fragmentation tsunamis, earthquakes and volcanoes evolution and extinction: dinosaurs and the fossil record glaciers, global warming, and climate change geologic time
EARTH 116, ENVIRON 116	Intro Field Geol	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	An introduction to geology in the field, this course is the equivalent of GEOSCI/ENVIRON 118/119 but is taught at Camp Davis, the University's Rocky Mountain Field Station near Jackson, Wyoming. It stresses principles and processes involved in the evolution of the earth. The course includes rigorous laboratory exercises in which students study minerals, rocks and fossils, and structures in their natural settings. Lectures are given both in camp and in the field, but much time is spent outdoors in the nearby Teton, Hoback, Gros Ventre, and Snake River Ranges. Other trips of special significance include the Wind River Range. Craters of the Moon, and Yellowstone Park.

Course Number	Title	Level	Level of Sustainability	School/College	Description
EARTH 222, ENVIRON 232	Introductory Oceanography	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts Æ Program in the Environment	This course explores the Earth's oceans in terms of geological, chemical, physical, and biological oceanography, with emphasis on understanding the oceans as an integrated system. We study the processes that form ocean basins, the forces that govern ocean circulation, the physical and chemical properties that influence the distribution of life, and the adaptation of organisms to their aquatic environment. We also discuss the ocean's role in mitigating global change and the consequences for oceanic ecosystems and human society.
EARTH 223, ENVIRON 233	Intro Ocean Lab	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts Æ Program in the Environment	One three-hour lab each week.
EARTH 380, ENVIRON 380	Mineral Resources, Economics, and the Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts Æ Program in the Environment	This course deals with mineral resource-related problems in a complex society. The course discusses the origin, distribution, and remaining supplies of mineral resources in terms of the economic, engineering, political, and environmental factors that govern their recovery, processing, and use. Topics covered in the course include nuclear waste disposal, strip mining, continent-scale water transfers, mineral profits and taxation, and estimation of remaining mineral reserves.
EARTH 450, ENVIRON 450	Ecosystem Science in the Rockies	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts Æ Program in the Environment	This 4-week course explores the principles of ecosystem science using field projects in the Rocky Mountains. The unique and diverse geological history and climate of this region controls the occurrence of terrestrial and aquatic ecosystems, and the plants and animals of which they are composed. We will develop and use an understanding of geological and meteorological processes to understand the distribution and function of grasslands, forests, and alpine ecosystems in the Rocky Mountains. The course is designed for majors in geological sciences, natural resources and environmental science to gain field-based knowledge and experience of Rocky Mountain geology and ecology. It is also designed for students majoring in other areas who have a general interest in this subject matter. This course will be team taught by professors from several different disciplines.
EARTH 477, ENVIRON 479	Hydrogeology	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts Æ Program in the Environment	This course provides an introduction to hydrogeology with particular emphasis to physical aspects. We will particularly focus on process and direct applications to geological settings. Problem solving is an important course component. The hydrologic cycle, physical rock framework, and properties of aquifer systems will be described and quantified. Groundwater flow and mass transport equations will be covered, as well as pump test design and analysis. Natural tracers and groundwater dating also will be discussed. An introduction to groundwater modeling with simulation of groundwater flow and mass transport will be provided.
EEB 320, ENVIRON 311	Rivers, Lakes, and Wetlands: Introduction to Aquatic Ecosystems	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	This field course introduces fundamental physical, chemical, and biological concepts and basic techniques necessary for the study of aquatic ecosystems. Topics include physical-chemical processes, an overview of aquatic fauna and flora, and surveys of major types of aquatic ecosystems, including rivers and streams, lakes and wetlands. Interactions between the hydrological cycle and the landscape provide the basic theme around which ecosystem presentations are organized. Field trips and laboratory exercises will focus on sampling representative environments, the collection/identification of biological specimens, and learning research techniques.
EEB 330	Biology of Birds	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	This course provides an introduction to ornithology with emphasis on field identification of the birds of eastern North America. Field trips are to a variety of habitats in the region. Labs include classification, morphology, and identification of study specimens. Lectures cover a variety of topics on the evolution, physiology, behavior, ecology and conservation of birds. Each student participates in a group project.
EEB 335	Biodiversity Research Seminar	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	Biodiversity Research Seminar --- This course aims to introduce undergraduates to current research topics in ecology and evolutionary biology. Students attend weekly EEB seminars presented by either outside invited scientists or by in-house faculty and graduate students. This is followed by a written critical synopsis, and instructor-led discussion, of the research presented.
EEB 341	Parasitology	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	An introduction to the study of parasitism, with special reference to the evolution of the parasitic habit.
EEB 348, ENVIRON 348	Forest Ecosystems	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	This field course is focused on the ecology of forest species and the characteristics of ecological systems which support them. Basic concepts of ecosystem structure and function are emphasized in lectures, discussions, and twice-weekly field trips to diverse upland and wetland forests in and surrounding the Biological Station. These include some of the finest old-growth hardwood and conifer forests in Michigan as well as dry, fire-prone pine plains, mesic northern hemlock-hardwood forests on moraines, diverse forested wetlands, and red oak forests which are the legacy of Native American agriculture. Emphasis is placed on the integration of topography, soil, and vegetation at each field site. The dynamics of fire ecology, regeneration ecology, and forest succession are stressed. Knowledge of forest species and ecosystem components through hands-on field work provide the basis for understanding why plants grow where they do. This ecocentric approach is applicable in temperate forest ecosystems around the world.
EEB 380	Oceanography: Marine Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	Marine ecology is the branch of biological oceanography that applies ecological principles to the study of marine life. Lectures cover the interrelationships of marine organisms and their environment. Organisms and communities from the following habitats are discussed: estuaries, the rocky intertidal zone, coral reefs, the coastal zone, the deep-sea and the open ocean. The course treats the ecology of diverse marine organisms ranging from bacteria to whales.
EEB 390	Evolution	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	This course covers the fundamentals of evolutionary biology with a focus on living organisms. It includes a historical survey of the development of evolutionary theory from ancient philosophers to the present, and critical examination of phylogenetic systematics, natural selection, population genetics, molecular evolution, micro-evolution, and macro-evolution.
EEB 420	Plant Evolution	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	This course aims to give students an advanced and updated perspective of plant evolution. It begins with an introduction on phylogenetic concepts, and then gives an update on phylogeny of photosynthetic life forms: eubacteria, archaea, algae, and land plants. The main parts of the course are to discuss evolution of plants in three perspectives: evolutionary genomics, evolutionary developmental biology, and evolutionary ecology. Evolutionary genomics will cover both organellar and nuclear genomes. For organellar genomics, the theories of endosymbiotic origins of mitochondria and plastids, as well as those theories of origins of algae via secondary or tertiary endosymbiosis, will be presented. For nuclear genome evolution, the following aspects will be covered: the composite origin of the genome at the beginning of eukariotic evolution; roles of transposons and introns in genome evolution in eukaryotes in general; the role of polyploidization in plant genome evolution; and syteny in angiosperm genomes. The evo-devo part will be devoted to gaining an understanding of how chemistry, physiology, morphology, and ecology of plants have evolved, and to aspects of chemical defense adaptation to different physical environments; development of different mating systems; and evolution of different pollination and seed dispersal strategies. Finally, interaction of plants and their biotic and abiotic environments will be examined from a historical and phylogenetic perspective. For plant-other organism interactions, three types are to be looked at: positive, neutral, and negative (all from the plant's perspective). The part on change of abiotic environment will focus on evolution of substrate, atmosphere, and geography.
EEB 441	Biology of Fishes Lab	Undergrad	Courses that include sustainability	Literature, Science, & Arts Æ Ecology & Evolutionary Biology, Literature, Science, & Arts	Optional laboratory course accompanying ENVIRON 422, providing an introduction to the field methods used in fish biology and fisheries, and examining the diversity of the Michigan ichthyofauna and major groups of world fishes.

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EEB 442	Biology of Insects	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	The course is intended to provide an introduction to the biology and diversity of one of the most important, and certainly the most diverse, groups of organisms. The emphasis is on insects as organisms, especially evolutionary, ecological, and behavioral aspects. The course will also emphasize insect examples of general biological principles, especially in evolution and ecology. The lectures will be devoted largely to general aspects of insect biology, including morphology, physiology, embryology, behavior, ecology, and evolution. It is impossible to appreciate much of this material without a good familiarity with the diversity of insects, which is in itself one of the major reasons for studying entomology. Therefore, the emphasis of the lab will be on taxonomy: learning many insect groups and their natural history, as well as developing the ability to identify insects. This will require considerable memorization, but is essential, especially for assimilating information on patterns of insect evolution and ecology. We hope you will obtain from the course an acquaintance with some general principles of biology as illustrated by insects; an appreciation of the rich opportunities for research that insects offer in every realm of biology; some knowledge of the fascinating diversity of insects; and an ability to go out, anywhere and at almost any time, and see the wonderful variety of life with which we share the world. Early in the course, we will devote lab sessions to field trips. You may use these as opportunities to add specimens to your collection. You should wear long pants and footwear that you are prepared to get wet or muddy. The rest of the labs will be devoted to learning taxa of insects, mostly by keying out specimens provided in the lab; and, as time permits, to work on identifying specimens in your collection using the keys in Borror, Delong, and Triplehorn, An Introduction to the Study of Insects, several copies of which will be available in the lab. You must learn to use the keys in this book; they will be needed for the lab exams.
EEB 451, ENVIRON 451, NRE 451	Biology of Mammals	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Introduces students to the diversity of mammals. Through laboratory exercises (one four-hour laboratory period/week) and lectures, participants will have an opportunity to see and learn about species representing all of the major groups of mammals. We will review their evolutionary history; examine their adaptations and lifestyles; and discuss current research in ecology, behavior, zoogeography, and systematics. An optional text supplements the lectures.
EEB 453	Field Mammalogy	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	An introduction to the study of mammals. Students will learn methods of studying mammals in the field by carrying out a series of projects on the wild mammals of northern Michigan. These projects will be designed to give familiarity with areas of active research on the ecology of mammals and practical experience with the excitement and headaches of formulating hypotheses, carrying out fieldwork, and analyzing data. Some familiarity with elementary statistics is helpful but not necessary.
EEB 457	Algae in Fresh Water	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	A survey of the algae of northern Michigan with emphasis on taxonomy and ecology. Students become familiar with the algae of streams, bogs, fens, swamps, beach pools, and the Great Lakes. Special attention is given to field investigations of periphyton and phytoplankton community ecology and their application to water quality assessment.
EEB 459	Systematic Botany	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	The integration of taxonomy, evolution, and phylogenetics, focusing on flowering plants. Training in the major groups of flowering plants, including classification systems, identification, naming, morphology, molecular evolution, and biogeography. Lab emphasis on representative families and genera of major plant groups, use of identification keys, and plant collections.
EEB 468	Biology of Fungi	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	This course provides an introduction to all aspects of fungal biology, including: biodiversity, genetics, ecology, and the importance of fungi to society. Fungi are ubiquitous, and students will learn to recognize and identify fungi as well as to study the myriad roles they play in ecosystems as saprobes, parasites, and mutualists. Fungi are also excellent model systems and we will investigate their use as genetic models and study how the dawn of the post-genomic era has impacted the field. The course will be composed of one hour of lecture followed by two hours of laboratory exercises, experiments or field trips.
EEB 470	Microbial Diversity	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	The course describes the biological diversity of prokaryotic microorganisms, members of the Domain Bacteria and Domain Archaea, examining the evolutionary origins of microbial life, the metabolic roles extant prokaryotes carry out in maintaining the biosphere, their physiological adaptations to the environment and to environmental extremes, and modern phylogenetic approaches for their identification and evolutionary analysis.
EEB 472	Plant-Animal Interactions	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Covers basic concepts dealing with the ecology of plant-animal interactions and coevolution. Topics include such interactions as behavior, pollination, seed dispersal and predation, and various mutualisms. Readings are from the current literature.
EEB 473	Aquatic Ecology Project Lab	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	This course introduces students to field and laboratory techniques in aquatic sciences. Several field trips to local lakes and streams during both ice cover and open water conditions will enable students to master sampling and measurement techniques for acquiring physical, chemical, and biological data. Includes chemical analyses of lake water, and taxonomy and counting methods for aquatic biota, including phytoplankton, zooplankton, mollusks, insects, and aquatic macrophytes. In addition, the course teaches students about the use of automated data acquisition technology and experimental methods applicable to lake plankton communities.
EEB 474	Wetlands Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	This course will look at a wide range of wetland habitats found around the station and examine what structures these communities by looking at basin morphology, hydrology, chemistry, human impacts, wetland plants and animals, biological adaptation, and energy pathways. We will also look at the complex issues involving the values of wetlands, wetland delineation, management and restoration. Students will also be involved in projects designed to provide greater depth on subjects or techniques of interest to the individual.
EEB 480	Evolution and Ecology Inference	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Teaches METHODS for formulating hypotheses and for generating predictions from them so that they may be tested with data. These methods will enable you, as a natural scientist, to participate responsibly in the design of your experiments and observations, and in the making of inferences from the data they provide, free of the burden of unwanted mathematical assumptions.
EEB 483	Freshwater Ecosystems: Limnology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Freshwater ecology is the study of environmental and ecological aspects of inland lakes and streams (also called "limnology"). Some of the topics covered in this course are: the origin of lakes; the importance of physical and chemical properties; the geochemical cycling of different elements such as carbon, phosphorus, and nitrogen; the ecology of aquatic bacteria, phytoplankton, zooplankton, benthos, macrophytes, and fish; the pollution and eutrophication of lakes; the recent concepts in stream ecology; paleolimnology; food-chain dynamics; energy flow; and experimental investigations using whole lakes.
EEB 485	Population and Community Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Principles governing the phenomena of single and interacting populations are examined, from basic tenets to cutting-edge research questions. Population and community-level perspectives are integrated by drawing parallels between approaches and considering how to scale up from the phenomena of one or a few species to the structure and dynamics of whole communities.
EEB 487, ENVIRON 409, NRE 409	Ecology of Fishes	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	There is a current biodiversity crisis as the species diversity and abundances of many species decline in nature. The three classes commonly called fishes include more species of vertebrates than all other classes combined. Fishes also have a higher rate of endangerment than all other classes of vertebrates, due to human use of aquatic resources. Ecology of Fishes is a course for juniors and seniors that focuses on the dramatic interaction between fishes and their habitats, as a driver of this biodiversity crisis. The course covers: physiological, behavioral, and numerical responses of fishes to biotic and abiotic factors; the relationship between environmental factors and fish energetics, growth, survival, behavior, and reproduction; adaptations of fish for survival under different environmental constraints in major habitat types; and the role of humans in fishery declines and fish conservation.
EEB 490	Evol at Pop Level	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Evolution at the Population Level --- This course deals with evolution of life from the population-level perspective, which ignores internal structure of organisms and, instead, considers their external features, emphasizing gene transmission and natural selection.
EEB 492	Behavioral Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Behavioral Ecology --- This course explores the behavior of animals in their natural environment. Students develop their understanding of evolution and learn how to apply natural selection to understand why animals behave the way they do.

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EEB 498	the Ecology of Agroecosystems	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Analysis of ecological principles as they apply to agricultural ecosystems, emphasizing theoretical aspects but also covering empirical results of critical experiments. While the emphasis is on principles, practical applicability is also explored where appropriate. Physical, biological, and social forces are integrated as necessary. Designed as preparation for active research in agroecosystem ecology.
EEB 466, MATH 466	Mathematical Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Mathematics	Mathematical models are the backbone of ecological theory; they form the basis for modern approaches to understanding, managing, and predicting the dynamics of ecological systems. This course provides an overview of the major classes of ecological models, with an emphasis on ecological dynamics. We will focus on principles guiding the formulation of models and on the mathematical techniques that can be used to analyze them. We will examine deterministic and stochastic models, structured and unstructured models, single- and multiple-species models. Because ecological systems are typically nonlinear, we cannot often solve model equations. Instead, we employ techniques of nonlinear, stochastic, and numerical analysis to obtain results. This course will introduce many of these techniques in the context of ecological theory.
EEB 315, ENVIRON 315	The Ecology and Evolution of Infectious Diseases	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	Introduces the population ecology and evolution of parasites and disease-causing agents impacting human, animal, and plant health. The emphasis will be on patterns of temporal change and spatial spread at the population level. Main themes include the impact of environmental change, particularly in climate, on infectious diseases, the connection between biodiversity and health, the role of disease in conservation, and the co-evolution of hosts and parasites.
EEB 489, ENVIRON 430, NRE 430	Soil Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	Soils as central components of terrestrial ecosystems. Major emphasis is placed on physical, chemical, and biological properties and their relationships to plant growth and ecosystem processes. Understanding is developed using a combination of lectures, field- and laboratory-based exercises, and individual research. The function of soils in forested ecosystems is the primary focus; however, examples are drawn from a wide range of terrestrial ecosystems. This course centers on the overlap of soil science, forest ecology, and ecosystem ecology. Our goal is to understand: how the interactions of landform, topography, climate, and biota over time lead to the patterns of soil development and the distribution of soil types that we observe within the landscape; how physical, chemical, and biological properties of forest soils affect water and nutrient availability to plants and, ultimately, ecosystem productivity; and how nutrients are cycled within forest ecosystems and how these processes are influenced by land management practices.
EEB 424, ENVIRON 415, NRE 415	Behavioral Ecology & Conservation Biology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment, Nat. Res. and Environment	Environments shape the behavior and life histories of animals, and animals' behaviors and life histories affect how we can act successfully to conserve and manage wildlife species. How can we use this knowledge? Because environments pose constraints, in any given environment, behaviors have 'better' (more effective, less costly) and 'worse' impacts on an organism's survival and reproduction. Understanding this complex problem requires that we generate testable hypotheses to understand the functional significance of the behaviors we see. We must consider hypotheses in at least six basic areas: the basics of selection, how the basics play out in different environments, how environments shape life history, life history strategies-mating effort, life history strategies-parental effort, and how life histories affect what conservation strategies will work.
EEB 436, ENVIRON 436, NRE 436	Woody Plants: Biology & Identification	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment, Nat. Res. and Environment	Woody Plants is an intensive field- and lecture-based learning experience, in which you will learn to identify 160 trees, shrub and vine species that are important in Michigan environments. You will learn about their taxonomy, distribution, habitat associations, and biogeographic history and how to identify them in their leafless winter condition.
EEB 440, ENVIRON 422, NRE 422	Biology of Fishes	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment, Nat. Res. and Environment	Lectures cover many aspects of the biology of lower vertebrates known as fishes, including evolution, physiology, functional morphology, phylogeny, bio geography, ecology, and reproduction. The systematic position of fish among vertebrates is discussed and exemplary assemblages exam.
EEB 476, ENVIRON 476, NRE 476	Ecosystem Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment, Nat. Res. and Environment	Ecosystem Ecology is a lecture/discussion course that focuses on understanding the physical, chemical, and biological processes regulating the dynamics of terrestrial and aquatic ecosystems. We discuss classic and current topics in ecology that have built our understanding of ecosystem organization and function. The course integrates across disciplines of physiological, microbial, population, and community ecology to understand how and why ecosystems differ in composition, structure, and function, and how ecosystems change over time. Students are expected to have a solid background in biology and ecology. We also expect that students will be able to use general principles of mathematics, physics, chemistry, and biology as tools to understand ecological processes occurring at the ecosystem level.
ECON 101	Principles of Economics I	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Economics, Literature, Science, & Arts	This course concentrates on microeconomics: how markets function, what markets do well, where markets do not work well, the distribution of income and wealth, the public sector, international trade, and environmental economics.
ECON 431	Industrial Organization and Performance	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Economics, Literature, Science, & Arts	This course will analyze the strategic interactions among firms and their effects on the social welfare. The topics will include the theory of firm, price discrimination, price/quantity competition, collusion, merger, entry deterrence, and antitrust laws. Selected news articles and antitrust cases will be used to illustrate some of the key concepts.
ECON 432	Government Regulation of Industry	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Economics, Literature, Science, & Arts	Analysis of government policies aimed at maintaining desirable economic performance, especially antitrust regulation and public enterprise.
ECON 437	Energy Economics & Policy	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Economics, Literature, Science, & Arts	This course is about energy markets. It is designed to help students make connections between economic concepts and real world regulatory policy questions and issues. The emphasis is on the insights that economic theory and empirical evidence can provide when thinking about the following questions: How do energy markets work? When should the government regulate energy markets? What can the structure of energy markets tell us about how to design and implement effective economic policy?
ECON 487	Urban Economics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Economics, Literature, Science, & Arts	Economic aspects of urbanization; intra-metropolitan location decisions of households and firms; and analysis of land, housing, and transportation markets and of public policy in these areas.
ENGLISH 125	College Writing	Undergrad	Courses that include sustainability	Literature, Science, & Arts » English Language & Literature, Literature, Science, & Arts	A study of rhetoric, both as a body of principles, and as a practical art, emphasizing the writing of expository and argumentative essays. In the past few years, food has been the subject of major motion pictures like Super Size Me, bestselling books like Fast Food Nation and The Omnivore's Dilemma, and policy debates about health care, energy use, and environmental sustainability. Americans are becoming increasingly convinced that, to borrow the title of another recent book, Food Matters. This section will focus on the creation of complex, well-supported arguments that matter in academic contexts through reading and writing about food. We will read a selection of the best popular and scholarly writing about food and discuss how writers create compelling arguments for different audiences and in different contexts. Writing assignments will require you to develop and defend original arguments about your personal consumption choices, mass media representations of food, and policies that affect the production, availability, and safety of food. You will become better informed about contemporary issues in food politics and learn to make more effective choices for the diverse writing tasks you will encounter in your college career and beyond.
ENGLISH 317	Literature and Culture	Undergrad	Courses that include sustainability	Literature, Science, & Arts » English Language & Literature, Literature, Science, & Arts	Green Indigenities
ENGLISH 319	Literature and Social Change	Undergrad	Courses that include sustainability	Literature, Science, & Arts » English Language & Literature, Literature, Science, & Arts	What Difference a Story Make?
ENGLISH 320	Literature and the Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » English Language & Literature, Literature, Science, & Arts	This course will look at the development of responses to American nature from the colonial period to the present. From colonial ideas about a new Eden, or a howling wilderness, we will move through Enlightenment concepts of order and/or sublimity, then to Transcendentalist claims about a spiritual nature, and finally look at 20th-century concerns about wilderness loss or management, toxicity, concepts of sustainability, and the dependence of the human on the non-human world.

Course Number	Title	Level	Level of Sustainability	School/College	Description
ENGLISH 328	Writing & Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » English Language & Literature, Literature, Science, & Arts	This is an upper level writing course that asks for essays -descriptive, narrative, argumentative, even ones that might be strongly advocating a particular position- that grow out of knowledge or curiosity about the natural world. Examples are drawn from environmental writing, literary and scientific, in the hopes that they may be used as models or inspiration.
HISTORY 223, ENVIRON 223	Trashed! A History of Garbage in the Modern World	Undergrad	Courses that include sustainability	Literature, Science, & Arts » History, Literature, Science, & Arts	This course traces the history of garbage since the middle of the 19th century and explores how the stuff humans discard and the methods employed for dealing with that stuff have shaped our world. This course connects global, local and public history and makes these connections tangible.
HISTORY 262	The American South	Undergrad	Courses that include sustainability	Literature, Science, & Arts » History, Literature, Science, & Arts	The American South --- This course explores race, culture, and "Southernness" in the twentieth century American South. We consider Southern identities in relation to historical events (such as segregation, the black freedom struggle, New Deal economics, recent Latin American migrations) and cultural elements (such as music, food, religion, sports). Throughout the course, we also pay attention to how the region's racial and cultural history has been shaped by gender, class, nation, and ethnicity.
HISTORY 321	Britain Since 1945	Undergrad	Courses that include sustainability	Literature, Science, & Arts » History, Literature, Science, & Arts	Britain Since 1945 --- This course will examine Britain's history after World War II and include the Cold War, the social and political challenges of the 1960s, the Conservative resurgence of the late 1970s, the Falklands war, and the fall of Margaret Thatcher. Special attention will be paid to the experience of war by civilian populations; the development of a "welfare state" and subsequent challenges thereto; Britain's decline as a world power; protest movements; the nuclear disarmament and peace movements from the late 50s/early 60s through the 80s; the influence of American culture on Britain; decolonization and the participation of Asians and Africans in British culture and politics; Welsh and Scottish nationalism; the Northern Ireland question; and ongoing political and cultural debates about class, education, the media, sexuality and gender roles; and Britain as a multi-cultural society.
HISTORY 364	American Suburbia	Undergrad	Courses that include sustainability	Literature, Science, & Arts » History, Literature, Science, & Arts	History of American Suburbia --- In post-1945 U.S. history, the suburbia has emerged as the dominant method of social organization, the primary focus of land-use planning, and the center of political power. This course will grapple with the dominant themes and legacies of American suburbia through a focus on popular culture imagery; social and political history; race, class, gender, and generational analysis; and spatial/developmental policy.
HISTORY 285, RCSSCI 275	Science, Technology, Medicine, and Society	Undergrad	Courses that include sustainability	Literature, Science, & Arts » History, Literature, Science, & Arts, Literature, Science, & Arts » Residential College	From automobiles and computers to immunizations and genetically modified foods, science, technology, and medicine permeate our lives and lifestyles. This course helps you critically think critically about the social dimensions of science, technology, and medicine and their implications for the choices you must make in modern life. We will explore questions such as: How have culture and politics affected the goals and designs of technologies such as the atomic bomb? How has science been shaped by politics, and vice-versa? How can history help us understand contemporary responses to the AIDS epidemic, stem cell research, and the pharmaceutical industry?
HISTORY 224, PUBPOL 224	Global Nuclear Proliferation	Undergrad	Courses that include sustainability	Literature, Science, & Arts » History, Literature, Science, & Arts, Public Policy (Ford)	This course presents a global perspective on the history and politics of nuclear weapons. It examines the science and technology of these weapons; the politics of their growth, spread, and control; environmental and health consequences of their development; and the cultural responses and social movements they have engendered. We begin with the bombing of Hiroshima and Nagasaki. Next we examine the unfolding of the Cold War, focusing particularly on the superpower arms race and exploring both U.S. and Soviet perspectives on these developments. Why and how have different states pursued nuclear weapons development? We first pose this as a general question and then move on to case studies. Along the way, we also examine the health and environmental consequences of uranium mining and nuclear testing, as well as the history of anti-nuclear protest movements. The course aims to introduce students to the complex, multi-layered history of nuclear policy issues. Students will be challenged to move past their political beliefs and ideologies (whatever these may be) in order to understand decisions and developments in historical context, and in relation to different cultural and national perspectives. They will be exposed to a variety of conceptual tools and theories to help them make sense of the material, drawing not only on the discipline of history but also on political science theory and anthropology.
CICS 401	International Studies Advanced Seminar	Undergrad	Courses that include sustainability	Literature, Science, & Arts » International & Comparative Studies, Literature, Science, & Arts	Transnational Urban Development - This course is an advanced seminar designed to bring an interdisciplinary perspective to the study of a topic of international significance.
INTLSTD 301	Topics in International Studies	Undergrad	Courses that include sustainability	Literature, Science, & Arts » International & Comparative Studies, Literature, Science, & Arts	This course is a focused and in-depth investigation of global phenomena, with attention to human rights, human security (civil conflict, economic development, social welfare, and health care), and sustainable economic and ecological systems. Readings rely on multiple methods and disciplinary approaches. In the process of studying these global phenomena, students discuss the strengths of specific methods and disciplinary approaches in improving their understanding of issues and problems that cut across nation-state boundaries.
INTLSTD 387	Topics in GEH	Undergrad	Courses that include sustainability	Literature, Science, & Arts » International & Comparative Studies, Literature, Science, & Arts	Topics in Global Environment and Health --- This course will cover topics in global environment and health.
ORGSTUDY 208	Business and the Natural Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Organizational Studies, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	This course is an introduction to business and the natural environment. We will start with an overview of the triple bottom line framework, in which corporations take into account social and environmental performance in addition to financial performance. Then we will focus on contemporary business activities that address the natural environment. We will discuss the role of the natural environment on business management and strategy, operations, supply chain, product innovation, and marketing.
PHIL 155	The Nature of Science	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Philosophy, Literature, Science, & Arts	In the long human attempt to understand nature, modern science is arguably our most successful and sophisticated endeavor, one that has revealed that reality is very different from how we perceive it. However, investigation into the nature of scientific knowledge uncovers a deep tension or instability between two fundamental beliefs about science: (i) scientific claims are justified empirically through observation and experiment; (ii) science discovers the true nature of the universe. Because of (i), scientific conclusions are especially objective, secure, and trustworthy, but taking (i) seriously seems to contradict (ii) by limiting scientific investigation to what is at least indirectly observable. On the other hand, taking (ii) seriously seems to weaken the objectivity that scientific conclusions enjoy when secured by empirical evidence. What, then, is it about the nature of science that confers epistemic authority on scientific opinion, and what are the scope and limits of that authority? In trying to answer these questions, we will investigate concepts like causality, law of nature, explanation and prediction, and confirmation by experiment.
PHIL 240	Environmental Ethics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Philosophy, Literature, Science, & Arts	This course introduces students to environmental ethics, which concerns the value and moral status of the environment and its nonhuman elements. Topics may include theories about which parts of nature have intrinsic value, duties to future generations, the significance of wilderness, sustainability, and environmental policy and economics.
PHIL 355	Contemporary Moral Problems	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Philosophy, Literature, Science, & Arts	The purpose of this course is to explore the moral issues confronting us in our daily lives and in our special disciplines. The topics discussed may include abortion, sex and sexual perversion, drugs, death and suicide, civil disobedience, punishment, pacifism, war, problems in medical ethics (eugenics, euthanasia, sanctity of life, organ transplants, defining death), environmental ethics, and the ethics of scientific research.
PHIL 356	Issues in Bioethics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Philosophy, Literature, Science, & Arts	An examination of various ethical issues having to do with biology, medicine, and human and animal life in general, such as abortion, euthanasia, the idea of the rights of animals, medical care and the rights and obligations involved in it.
POLSCI 380, ENVIRON 312	Environmental Politics and Policy	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Political Science, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment, Public Policy (Ford)	This course is an advanced offering on environmental politics and the environmental policy-making process.Â The course will consider both processes of policy formation and implementation, placing particular emphasis on the development of alternatives to conventional regulatory practices at federal, state, and local levels of government.
ENVIRON 301, HISTART 301	Nature Culture Landscape	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course examines human landscape interventions throughout Western history within a series of spatial archetypes that embody various layers of the human/nature dialectic. Focus is on the interplay of cultural beliefs, values, social realities and artistic expressions within the medium of landscape and their impact in contemporary environmental perception.

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ENVIRON 309	GIS Explorations of the Past, Present, and Future	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Use of spatial analyses is growing rapidly in many disciplines, from anthropology to zoology. Employers in many fields increasingly seek job applicants with these skills. This course is intended to introduce GIS to undergraduate students from many disciplines and to give them hands-on experience in applying the concepts and using the skills required to conduct spatial analyses. This course uses geographic information systems (GIS) to help understand and analyze environmental problems as well as spatial questions in the sciences, social science and humanities. A hands-on approach is used to demonstrate GIS principles using a wide variety of examples. This course will enable undergraduate students to make maps and conduct spatial analyses for future classes, internships, and employers. It will also prepare them for more advanced GIS classes now offered at the graduate level.
ENVIRON 310	Toxicology: The Study of Environmental Chemicals and Disease	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Explores relationships between environmental chemicals and adverse human health outcomes, providing an introduction to the study of toxicology. More specifically, the course examines chemical and biological factors that determine and influence toxicity, and the role of chemical exposure in the development of specific diseases such as cancer, birth defects, and reproductive disorders.
ENVIRON 313	Environment & Development	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Dilemmas of Power and Place in a Global World -- This course examines the interaction between development and environment in less developed regions of the world. It will focus especially on various aspects of environmental protection and management ranging from conservation, to decentralization of natural resources management, to the emergence of global institutions for environmental governance.
ENVIRON 317	Conservation of Biological Diversity	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Overview of historic and present-day causes of species extinction, and of biological principles central to species conservation and sustainable management of ecosystems. Topics covered include episodes of extinction and diversification over earth history; geographic distribution strategies; and sustainable use of ecosystems. Satisfies the upper-level writing requirement
ENVIRON 356	Environmental History and the Tropical World	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Patterns of historical change in major ecosystems of the tropics and subtropics, in relation to theories of global environmental history. Transformations of natural resources in developing nations as a consequence of colonial governments and capitalist economies since 1800, in tropical forests, savanna lands, and mountain systems, and especially in the rapid escalation since 1945. The rise of modern systems of tropical resources management and conservation.
ENVIRON 377	Literature & the Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course will look at the development of responses to North American nature from the pre-colonial period to the present. Beginning by understanding Amerindian peoples as willful environmental actors, we will look at European contact as, in part, a scene of conflicting land use and land-concept regimes. Then, from Columbus's anticipations of Eden to representations of wilderness trials by Puritans, we will move to Enlightenment understandings of the orderliness and/or the sublimity of American nature, and at early national attempts to make a precarious nation inevitable and a "natural" through the landscape. We will read Thoreau and Emerson's Transcendentalist claims about the natural world; Muir's meditations on sacred geological time in the Sierra Mountains; and early twentieth century writers (Cather, Leopold, Faulkner, Stoneman Douglas, and Hurston) who describe changes, via settlement, deforestation, drainage, and mining, to the prairies, the California desert, and the southern wetlands and forests. We will encounter later 20th-century authors (Carson, Lopez, Dillard) concerned about toxicity, concepts of sustainability, and the dependence of the human on the non-human world. We will end by thinking about the interlocked concepts of the global and local.
ENVIRON 404	Cars, Energy & Chemistry	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course examines the basic chemistry of fuel materials used in transportation applications, such as fuel cells and biogenerated materials. With the growing momentum toward electric vehicles, we also explore topics such as thermodynamic relationships, energy conversion and storage technology, and policy implications of using a rebalanced power grid to supply energy for transportation.
ENVIRON 405	Urban Sprawl: policy & Politics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course investigates the political imperatives and policy frameworks at the local, state, and national levels that drive land development in America. It leverages political science, history, law, and urban planning to understand how public policy does (and does not) guide land use patterns, and how it might do so differently in the future. The course uses the phenomenon of urban sprawl as a lens through which to integrate multiple disciplinary perspectives in a rich and nuanced understanding of policy change. Students are required to exercise, in written and oral work, their faculties of analysis and (especially) synthesis, unpacking a complex policy challenge into discrete elements and then analyzing the interplay among these elements. The course is first and foremost a capstone experience in critical thinking, using a policy arena with which the students are familiar as a platform for that experience. The course is organized as a seminar. While it does teach a certain policy vocabulary and test students' critical thinking and writing skills, it ultimately demands much more. It requires students to actively interrogate and synthesize the course material in order to generate a new, shared understanding. Students' formal (written) and informal (in-class) commentary on the readings are central to the organization of each class session (along with brief lectures and small-group exercises). Their research projects culminate in memos that are required reading for the final weeks of the class. In short, the course expects students to exercise the skills that professional policy work and/or graduate school require: active synthesis of new understanding.
ENVIRON 410	American Environmentalism and the Frontier West	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	The exploration and development of the frontier West has shaped American history and with it both our national identity and relationship to the natural world around us. This course considers first-hand accounts and historical narratives to analyze how the settlement of the American West has influenced our environmental values and ethics.
ENVIRON 449, NRE 449	Organizational Theory and Change	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Meeting the environmental goals requires the effective administration of well-thought out environmental policy. This course focuses on the administration of environmental activities, with special attention given to organizational design, inter-agency networks, public participation in agency management and environmental governance. The course is conducted as a seminar with emphasis on student participation in the analysis of cases and materials related to these and related matters.
ENVIRON 463	Topics in Environmental Natural Science	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This special topics course seeks to examine environmental problems and issues from a natural science perspective. Specific natural science topics will vary by term.
ENVIRON 431, EARTH 431	Terrestrial Biomes Past, Present & Future	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts » Earth and Environmental Sciences	While biomes are the major organizing feature of terrestrial ecosystems, dependent on the organisms, ecosystems and climate of the planet, the details of these environments have changed over the history of our planet and will continue to do so. To understand fully the impacts of shifting biomes and anthropogenic climate change, we need to also understand the assembly of past environments. This course focuses on the plant primary producers as it surveys important biological innovations, examples of past ecosystems from the fossil record, the relevance of climate to terrestrial environments, and the changing world of today and tomorrow.
ENVIRON 312, POLSCI 380	Environmental Politics and Policy	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts, Literature, Science, & Arts » Political Science	This course is an advanced offering on environmental politics and the environmental policy-making process. Considers both processes of policy formation and implementation, placing particular emphasis on the development of alternatives to conventional regulatory practices at federal, state, and local levels of government.
ENVIRON 360, PSYCH 384	Behavior and Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts, Literature, Science, & Arts » Psychology	This course deals with two central themes: First, environmental problems are people problems, requiring an understanding of how people think, what they care about, and the conditions under which they behave most reasonably. Second, human behavior makes the most sense when studied in the context of the environment both present and evolutionary. The course builds a model of human nature based upon research in the field of environmental psychology.
ENVIRON 390, RCIDIV 390	Environmental Activism: Citizenship in a Republic	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts » Residential College	This course defines environmental activism as a social movement designed to affect positive and sustainable environmental change. We will articulate an overarching set of values to which people can respond, as well as a shared set of symbols, heroes, slogans, and other cultural referents.

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ENVIRON 412, PUBPOL 412	Environmental Values in Public Policy	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts, Public Policy (Ford)	Public policy embodies an assortment of value systems. While individual value systems express coherent, consistent approaches, public policy expresses an amalgam of values, with corresponding decrease in coherence/consistency. This course explores the relationships between various environmental values and public policy through analysis of policy issues at local, state, and national levels.
PSYCH 280	Introduction to Social Psychology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Psychology, Literature, Science, & Arts	An introductory study of the interrelationships of the functioning of social systems and the behavior and attitudes of individuals.
PSYCH 335	Introduction to Animal Behavior	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Psychology, Literature, Science, & Arts	This course is an introduction to the evolutionary study of Animal Behavior. This class will provide an opportunity for students to learn about behavior from a biological perspective. We will start by reviewing evolution and natural selection. The remainder of the course looks at why animals behave the way they do in nature, focusing on causes of behavior. We will address immediate (or "proximate") causes of behavior including genetic, neural, and hormonal influences on behavior. However, the main emphasis of the course will be on "ultimate" (or long-term) causes of behavior. Thus, we will look at behavior primarily in relation to an animal's fitness or success. Topics covered will include foraging, habitat selection, mating systems, sexual selection, communication, and cognition. Emphasis will also be on learning how scientists study behavioral questions, including how to test adaptive hypotheses.
PSYCH 338, ANTHRIO 368	Soc Beh Primates I	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Psychology, Literature, Science, & Arts, Literature, Science, & Arts » Anthropology	This course will review the social systems and behavior of our closest living relatives, the primates. The course will be divided into three parts. I will begin by outlining questions about primate behavior. In this section the order primates will be introduced by examining the biology and behaviour of prosimians, monkeys, and apes. Second, various aspects of social primate systems including spacing, mating, and grouping patterns will be discussed. The course will conclude by reviewing selected topics of primate behavior, such as infantile and vocal communication. I will draw heavily on field studies of primates and emphasize their behavior in natural environmental and social settings.
RCCORE 100	RC Core: American Writers and the Environment	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Residential College, Literature, Science, & Arts	Everywhere we look there is a "green" magazine issues, green clothes, eco-vacations, hybrid-cars. It may seem that this desire for the environment is newfound. Yet, there is a rich history of American environmental literature first in response to the taming of the American wilderness, and later extolling the majesty of the land that defines America. This course is an attempt to discover what roles have been played by literature in the ecology of the human species (Meeker), and focuses on the close association of nature and art in American literature. We will consider how American writers, in shaping stories and poetry, have tried to reconcile the processes and values associated with wilderness and civilization. We will examine the historical and cultural backgrounds of the wilderness theme through writers such as Crèvecoeur, Jefferson, Cooper, Thoreau, Melville, Jewett, Faulkner, Cather, and Dillard. We will also study authors not usually taught in surveys of American literature, John Burroughs, John Muir, Mary Austin, Aldo Leopold, Edward Abbey, Barry Lopez, and Terry Tempest Williams. We will engage in a bit of nature writing by taking advantage of the outdoor spaces on, and near, campus.
RCSSCI 315	International Grassroots Development	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Residential College, Literature, Science, & Arts	What does "good development" mean to you? Do impoverished communities around the world need democracy? High quality "Western" medicine for all? Spiritual enlightenment? Debt forgiveness? High tech education? Liberation from U.S. corporations? Gender equality? A return to ancient values and practices? Equality on the world stage? Or to just be left alone? In this course we will look at how different assumptions about the Global South drive conflicting solutions proposed by governments, aid agencies, religious groups, human rights activists, the business community, rebels, idealists, and grassroots organizations. Be prepared for lively discussion, a deep, personal examination of your own beliefs and values, lots of writing and lots of help with your writing. Junior or senior status required. Some previous courses in economics, political science, anthropology, and/or lived experience in the Global South may be helpful.
SOC 315	Economic Sociology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	The discipline of economics generally treats the economy as separate from social relations. In contrast, economic sociology "embeds" the economy by considering it as integrally related to culture and politics rather than as a separate "non-social" sphere. In the first part of the course, we develop intellectual foundations for economic sociology by contrasting economic and sociological views of the economy. We then proceed to "embed" the economy by taking a series of institutions conventionally understood to be "economic" in nature — money, markets, firms, production, consumption, etc. — and analyzing these institutions in sociological terms. In the third and final part of the course, we introduce the notion of economic citizenship through a detailed examination of taxation. This seemingly dry topic is actually rife with sociological significance, and we use taxation to raise questions about gender relations, social inequality, the welfare state, and contemporary politics in U.S. society.
SOC 354	Law and Society	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	This course explores theoretical perspectives on the connection between law and society; explanations for legal compliance, deviance, and resistance; the relationship between "law on the books" and "law in action;" the relationship between law and social change; and law's ubiquitous role in popular culture.
SOC 422	Latin America	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	Sociology of Latin America — This course approaches Latin America through the lens of politics, often from a comparative and historical perspective. Drawing examples from various countries over a 200 year period, it examines such sociological issues as colonialism, race, class, nationalism, the nation state, democracy, international influences, contentious politics, and social movements.
SOC 430	World Population Dynamics	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	Major demographic shifts will be examined in this course. For many centuries, world population grew very slowly, due to a general balance between the number of births and the number of deaths. Since the 18th century, the rate of growth of the world's population has increased, due to a decline in mortality. Mortality declined first in Europe. Then, first in France and later elsewhere in Europe, fertility declined to a level close to that of mortality. Since World War II, mortality has declined in most of the less developed region of the world. In the absence of compensating declines in fertility, population growth rates in the less developed part of the world, and, consequently, in the world as a whole, increased, reaching a peak in the 1960s and 1970s. This high rate of population growth led to widespread concern about a population explosion. Since the 1980s, fertility has declined in most of the less developed region of the world, although in most of the developing world, the level of fertility remains higher than the level of mortality. Some developed countries are now experiencing population decline, with most developed countries expected to experience population decline by 2020. The age structure of the populations of most countries in the world has become older, partially due to mortality declines, but especially due to fertility declines. This has led to concerns about the size of the future labor force and the source of support of a growing elderly population. International migration has increased, mainly from the less developed region of the world to the more developed region of the world. Immigration has slowed population decline in many more developed countries, although what is an acceptable level of immigration has spurred a vigorous policy debate. All of these population dynamics, the causes and the likely consequences of these changes will be examined in the course.
SOC 461	Social Movements	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	Social Movements
SOC 475	Introduction to Medical Sociology	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Sociology, Literature, Science, & Arts	This course provides students with an understanding of the influence of social and cultural factors on health, illness, and medical care.
WOMENSTD 254	Gender & the Arts	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	Introduction to Gender and the Arts — This course is an introduction to gender issues in a range of art forms: literature, music, theater, film, dance, and visual arts. We consider how performances of femininity, masculinity, and sexuality intersect with race, class, and ethnicity. Then we think about how these issues are produced and received by artists and audiences in the past and present.
WOMENSTD 330	Feminist Thought	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	This course will examine theoretical approaches to understanding the conditions and constructions of women, focusing on close analysis of historical and contemporary texts that deal with the different kinds, causes, and possible solutions to women's oppression. This may be done by examining these issues across disciplines within academia by inviting guest speakers, by reading diverse contemporary theory, or in the case of "Black Feminist Thought," to examine slave narratives, novels historical accounts theoretical analyses and life stories.

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WOMENSTD 331	Adv Gender & Law	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	Advanced Gender and the Law --- This course is an advanced treatment of the relationships between law and identity in the contemporary U.S., with a particular focus on gender, race, and sexuality. We study legal cases, statutes, and interdisciplinary scholarly writings on topics such as gender and international law, surveillance and regulation in the lives of poor women, health law, and marriage rights. Students work in small groups developing legal briefs and then complete a moot court exercise.
WOMENSTD 335	Gender&Globalization	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	Gender and Globalization --- This course offers a critical and feminist examination of globalization as an ongoing and historical process, as discourse, and as representation. We will examine the impacts of the responses to the global reach of capitalism through the lens of gender relations, especially as it affects constructions of the subject 'women' cross culturally.
WOMENSTD 385	Directed Reading	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	Directed Reading --- This course offers students the opportunity to pursue an independent, interdisciplinary reading project on any subject related to women and gender. A final written report is required, but the format (e.g. a research paper, with an
WOMENSTD 433	Adv Top Gender Race	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	Advanced Topics in Gender, Race and Ethnicity in the U.S. --- This special topics course examines the intersection of gender, race, and ethnicity in the U.S. in order to consider differences among women and men, as well as the impact of multiple categories of identity on experience and on the formation and contestation of gender itself.
WOMENSTD 438	Gender Health Africa	Undergrad	Courses that include sustainability	Literature, Science, & Arts » Women's Studies, Literature, Science, & Arts	Gender, Health, and Well-being in Africa --- This course focuses on how gender is intertwined with health and well-being in sub-Saharan Africa. It emphasizes the importance of situating health issues within broader social contexts, with special attention to women's sexual health. It engages a range of materials, including ethnographies, journalistic accounts, novels, films, and public health interventions.
EEB 492	Behavioral Ecology	Undergrad	Courses that include sustainability	Literature, Science, & Arts, Literature, Science, & Arts » Ecology & Evolutionary Biology	This course emphasizes the fascinating behaviors that animals use to solve ecological problems. We have good theoretical reasons to expect male animals to try to mate with many females; do males do that, and if so, what behaviors lead to success? Predators searching for prey ought to abandon areas that seem to be unproductive; can we successfully predict what their "optimal giving-up time" is? Sibling animals fight with each other; after taking the course, you'll understand how natural selection produces these aggressive behaviors. Class time is split between lectures and ambitious, original research projects.
HISTORY 231	Social Science Topics in History	Undergrad	Courses that include sustainability	Literature, Science, & Arts, Literature, Science, & Arts » History	North American Environmental History
HISTORY 328	Humanities Topics in History	Undergrad	Courses that include sustainability	Literature, Science, & Arts, Literature, Science, & Arts » History	U.S. Urban Environmental - This course examines an aspect or topic in history not covered under a specific country or time period. Topics offered under this course number are taught from a Humanities perspective.
MATH 462	Math Models	Undergrad	Courses that include sustainability	Literature, Science, & Arts, Literature, Science, & Arts » Mathematics	Mathematical Models --- Construction and analysis of mathematical models in physics, engineering, economics, biology, medicine, and social sciences. Content varies considerably with instructor. Recent versions: Use and theory of dynamical systems (chaotic dynamics, ecological and biological models, classical mechanics), and mathematical models in physiology and population biology.
HMP 200, PUBHLTH 200, PUBPOL 210	Health & Society: Introduction to Public Health	Undergrad	Courses that include sustainability	Public Health » Health Management & Policy, Public Health, Public Policy (Ford)	This course will serve as an introduction to the major issues of public health and health care in the United States -- what they are, what determines them, and how they can be addressed. The course will provide a broad overview for students looking for only an introduction to the field, as well as a good grounding for students who wish to pursue additional coursework in the subject. The course will explore the principal determinants of health and disease, with a special emphasis on environmental, social, and political influences, with explicit attention to how these determinants differ depending on a person's education, occupation, race, ethnicity and socioeconomic status. The course is designed to provide students with an understanding of the broad field of public health in both the U.S. and globally, as well as an understanding of the U.S. public health infrastructure for monitoring and improving the public's health.
PUBPOL 201	Systematic Thinking About Problems of the Day	Undergrad	Courses that include sustainability	Public Policy (Ford)	The main idea that we want to get across is implicit in the title: Systematic thinking -- largely from the social sciences, but with the application of scientific methods and knowledge more generally -- can make a difference in the way that we approach and solve current problems. This will be a sophomore level course, offered for four credit hours. The class will consist of three hours of lecture and one section review each week. For each topic, there will be at least two faculty members, teaching a module together. Between 3 and 6 of these topics will be covered: vaccines and drugs for diseases that are more prevalent in developing countries; the Kyoto accords and policy related to global warming; No Child Left Behind and other national education policy issues; national health insurance; AIDS (national and international); intellectual property issues (such as the case involving Google); electoral college reform; affordability of higher education; globalization, trade and U.S. workers; and stem cell research.
PUBPOL 441	Soc Inequal&Pub Pol	Undergrad	Courses that include sustainability	Public Policy (Ford)	Social Inequality and Public Policy --- This course introduces students to sociological approaches to studying social inequality and public policy in the United States. Major course topics include inequalities related to neighborhoods, family, and employment. Students will examine how the aforementioned inequalities are experienced by various race, class, and gender.
SW 400	Social Problems & Social Work Today	Undergrad	Courses that include sustainability	Social Work	This course is considered an advanced, undergraduate elective which is designed to familiarize students with the profession of social work and also to recruit undergraduate students into the school's MSW program. The particular social problems selected for discussion will change from year to year depending on faculty and student interest and the contemporary context. The opening sessions of the course will briefly overview the social context for the kinds of roles, interventions, and fields of service that the profession generally operates from, before exploring in depth the professions response to each selected social problem. Important professional themes like: multicultural sensitivity to various diversity dimensions such as ability, age, class, color, culture, ethnicity, family structure, gender (including gender identity and gender expression), marital status, national origin, race, religion or spirituality, sex, and sexual orientation; empowerment; prevention; and value based intervention will also be reviewed in this course. Note: this course is distinguished from a more traditional course on social problems since it focuses specifically on a limited number of selected social problems a
ARCH 555	Building Systems and Energy Conservation	Graduate	Sustainability Course	Arch. and U.P. (Taubman) » Architecture, Arch. and U.P. (Taubman)	This course evaluates all building systems and services with regard to their influence on design. Of particular interest are: response to climatic factors and internal functions, integration of building fabric and environmental controls, choice of materials and construction processes, systems operation and energy consumption, energy conservation and management, and first costs versus life-cycle costs. Case studies of various building types and systems analyses are presented.
ARCH 575	Building Ecology	Graduate	Sustainability Course	Arch. and U.P. (Taubman) » Architecture, Arch. and U.P. (Taubman)	Provides students with an understanding of ecological principles in architecture. Principles of life-cycle design, economy of resources and humanistic design are introduced and ecological factors associated with each of these principles are examined. Design strategies to increase environmental sustainability in buildings are investigated. An emphasis is given to how environmental factors (heat, light, and sound) influence thermal, visual, and acoustic qualities in built-in environments. Field trips to visit selected buildings to analyze their ecological characteristics comprise an important part of the course.
UP 515	Liquid Planning	Graduate	Sustainability Course	Arch. and U.P. (Taubman) » Architecture, Arch. and U.P. (Taubman)	Liquid Planning --- This course will study the urbanized hydrology of the Great Lakes Watershed Basin through different disciplinary lenses. Students will work in multidisciplinary teams to examine the implications of storm water management practices, and will produce design documents, three-dimensional studies, and short report documenting the integration of diverse design processes.
UP 525	Food Systems Planning	Graduate	Sustainability Course	Arch. and U.P. (Taubman) » Urban and Regional Planning, Arch. and U.P. (Taubman)	This course introduces ways of understanding, analyzing and shaping food systems. We will examine historical and contemporary trends in food systems from environment, socio-political, health and economic perspectives. Emphasis is on the role of planners in facilitating food systems change through an exploration of food planning and analyze tools, policies, grassroots movements, and governance strategies emerging in the US and globally.

Course Number	Title	Level	Level of Sustainability	School/College	Description
UP 527	Infrastructure Planning in the US & Developing Countries	Graduate	Sustainability Course	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	Infrastructural networks (water, sewerage, electricity, information) are constitutive features of metropolitan life. In cities around the world, large numbers of urban residents lack access to basic infrastructure and services. Many city dwellers in developing countries do not have regular access to such basic amenities as piped water, sanitary toilet facilities, electricity, sewerage, paved roads, and policing). In the United States, urban infrastructures often break down, sometimes with disastrous consequences (Katrina and New Orleans, for example). The aim of this course is to explore the environmental and social impact of contemporary infrastructure planning. The basic premise is that cities are social products of transformed nature. City-building processes "make" cities into hybrids of the natural and the social, the environmental and the cultural. This course takes a comparative perspective in examining infrastructure planning and in the US and developing countries. It addresses the following questions: 1. What current theoretical perspectives can assist us in understanding the relationship between cities and nature? 2. What are the driving forces behind infrastructure planning and delivery, and what are the causes for their uneven distribution? 3. What roles have urban planners and other stakeholders played in choosing between different approaches to addressing infrastructure needs of urban residents? The course will draw heavily on case studies from cities in Asia, Latin America, Africa, and the United States. The class will be conducted in a seminar format, and students will also engage in in-class debates on controversial issues, including the balance between centralized and decentralized approaches to infrastructure delivery, the privatization of basic social services, and the role of local and community-based approaches to infrastructure delivery. Students will also be required to write either one comprehensive term paper or several shorter ones. Students will also be required to do a presentation on a case study of a specific program, policy or project related to infrastructure.
UP 532	Sustainable Development: Resolving Economic & Environmental Conflicts	Graduate	Sustainability Course	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	A growing body of evidence suggests that human populations world-wide are not living on the earth in ways that can be sustained indefinitely given current patterns of natural resource consumption, population growth, land development, and institutional arrangements. In response to this predicament, the concept of "sustainable development" has become prominent in popular and academic policy-making and planning debates over the past decade. Does the notion of sustainable development itself offer any useful guidance for making public policy and planning decisions, or is it merely an attractive oxymoron that different interests can agree on only at an abstract level? The goal of this class is to explore this question in depth. The course begins by considering the variety of ways in which our current lifestyles, locally and globally, are not sustainable, and then works through the concept of sustainable development from different vantage points: in terms of fundamental principles, scale (from global to local), and institutions, policies, and laws. Finally, the course addresses a variety of policy-making and planning prescriptions that have been offered and assesses whether and how those various prescriptions will likely work in practice. Working in groups, students test these theories of sustainability by applying them to selected client communities in Michigan.
UP 533	Sustainable Urbanism and Architecture	Graduate	Sustainability Course	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	An in-depth exposure to American and international urban planning, architecture, urban design, and landscape architecture that is environmentally sustainable, as well as culturally enriched, aesthetically accomplished, socially equitable, and economically viable.
UP 575	Metropolitan Structures	Graduate	Sustainability Course	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	This reading seminar examines the economic, social, and political forces that shape urban development, including explanations for the size, location, and functioning, of cities and their metropolitan regions. The course draws on an interdisciplinary and constantly evolving body of knowledge that observes and interprets the form and function of human settlements. These theories are indispensable for understanding the origins of cities, the persistence of urban and regional spatial patterns, the distinctive nature of urban problems, and the importance of tracing the source of urban challenges to larger metropolitan dynamics. The course explains why cities exist, why some are big and some are small, why some are specialized, and how they are interrelated in a linked network of cities. We look at several key issues of critical importance to urban planners from the perspective of social justice and sustainability, including racial segregation, urban sprawl, regional governance, poverty, the delivery of services, and how environmental problems are related to social problems. A central theme of the course is to identify how social relations affect social inequality and environmental degradation, and to examine how a more engaged citizenship can contribute to better urban development.
UP 634	Integrative Field Experience	Graduate	Sustainability Course	Arch. and U.P. (Taubman) Å» Urban and Regional Planning, Arch. and U.P. (Taubman)	A one- or two-term capstone experience involving second-year students working directly with community-based organizations in urban neighborhoods and planning districts in Detroit.Å Following general introduction and orientation to the study area and issues, students form small groups to work intensively on projects in collaboration with neighborhood leaders and residents in improving their situation.Å Presentations will be made at community meetings in early December and late April.
ES 646, STRATEGY 646	Solving Societal Problems Through Enterprise and Innovation	Graduate	Sustainability Course	Business (Ross)	The world's toughest problems can become opportunities for for-profit companies, non-profits, and other enterprises. These include challenges in the areas of poverty, health, education, the environment, and other social issues, such as treating women and children better. We will pay significant attention to how companies working at the economic base of the pyramid in the developing world and the West can develop successful businesses, though we will focus on other opportunities as well. We will see how many innovations in this area embrace new business approaches that are supported by leapfrog applications of information and communication technology. We will look at many examples of societal development through enterprise, try to spot trends, and look for frameworks. We will see that part of what makes such solutions work is finding ways to adopt innovative perspectives and devise innovative solutions. This course is non-technical, highly interactive, and requires no special background. It should be of interest to those wishing to understand where new business opportunities for serving society lie and how organizations can innovate to take advantage.
FIN 637	Finance and the Sustainable Enterprise	Graduate	Sustainability Course	Business (Ross)	This course deals with unique financial valuation and management issues faced by a sustainable business. We will study the efficacy of traditional and modern financial methods in enabling corporations to develop and implement sustainable strategies.
STRATEGY 564	Strategies for Sustainable Development I: Competitive Environmental Strategy	Graduate	Sustainability Course	Business (Ross)	This course deals with environmental issues from a strategic perspective. It focuses on how environmental pressures (e.g. sustainable development) and environmental problems (e.g. global warming, air pollution, waste-disposal), impact corporate mission, competitive strategy, technology choices, product development decisions, and production processes. Basic concepts of ecology and environmental science are discussed and contrasted to those associated with the traditional economic paradigm.
STRATEGY 565	Strategies for Sustainable Development II: Managing Social Issues	Graduate	Sustainability Course	Business (Ross)	The pressure for sustainable development has significant implications for firms, particularly large multinational corporations. With free trade on the rise, long-term opportunities exist for firms able to identify, develop, and deploy technologies, products, and services that contribute to sustainable practices and resource use in the developing world. This course examines how long-term competitive positioning can be secured through strategies such as positioning can be secured through strategies such as environmental partnerships, technology cooperation, and collaborative planning.
STRATEGY 566	Systems Thinking for Sustainable Development & Enterprise	Graduate	Sustainability Course	Business (Ross)	Challenges to a sustainable human future such as climate change, population growth, biodiversity loss and persistent poverty are characterized by extraordinary detail and dynamic complexity. This course fosters the skills of systems thinking and systems dynamics modeling necessary for understanding global environmental and social change. This holistic and dynamic understanding is employed to chart pathways for sustainable human development and business.
STRATEGY 680	Business in Society	Graduate	Sustainability Course	Business (Ross)	The world faces many large problems such as climate change, environmental degradation, global poverty, and inequality. This has led many people to argue that business should take the lead in addressing these problems and fulfill its corporate social responsibility (CSR). At the same time, business is under increasing pressure from activist shareholders to maximize shareholder value. The primary goal of this course is to prepare you to deal with this challenge as a top executive in private or public organization by giving you an opportunity to explore competing views in depth and to work out your own position on them.
STRATEGY 735	Topics in Global Sustainable Enterprise	Graduate	Sustainability Course	Business (Ross)	This seminar will be taught by a visiting practitioner from the corporate, non-profit or government sector. It will address subject matter related to Global Sustainable Enterprise, drawing on the instructor's specialized area of expertise.

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BA 605, NRE 605	Green Development	Graduate	Sustainability Course	Business (Ross), Nat. Res. and Environment	The built environment is a major source of society's environment impact; and is a major opportunity to find solutions. This course explores green development from a variety of perspectives: energy, heating, water use, construction processes, architectural design, site planning, brownfield development and others.
BE 527, NRE 527	Energy Markets & Energy Politics	Graduate	Sustainability Course	Business (Ross), Nat. Res. and Environment	The goal of this course is to give students a solid grasp of the environmental and social impacts of, and the institutions that govern, energy use, so that you can play a more effective role in shaping future policy or business decisions. We will begin with basic scientific and technological facts regarding the major uses for and sources of energy. We will then study energy markets (including spot and future markets), and what they are capable of accomplishing; we will also study the ways energy markets may fail. This will lead into an overview of the role of government in influencing energy decisions, starting with a high-level perspective, and then working with a series of case studies that examine in depth what government has accomplished in the area of energy policy. The course will wrap up with several current policy/business issues such as renewable portfolio standards, markets for renewable energy credits, and integrating the transportation sector into a cap-and-trade system for greenhouse gas emissions.
STRATEGY 525	Erb Institute Seminar	Graduate	Sustainability Course	Business (Ross), Nat. Res. and Environment	This Seminar surveys the integration of natural and human systems and addresses ways in which science and business can move towards a sustainable human future. It is designed to enable new and prospective Erb MS/MBA students to 1) discover what each believes about sustainable development and enterprise; 2) pinpoint what each wants to know and endeavor to learn while in the program; and 3) facilitate careful reflection about each student's future path through life and work, after they graduate. The Seminar is oriented around the Millenium Ecosystem Assessment (MA), a four year study, completed in 2005, that brought together nearly 1,400 experts from 95 countries to conduct a global inventory of the state of our ecosystems, quantify the effect that human activities are having on them and make suggestions for the future. In exploring the results of the MA, students will be introduced to a range of U of M faculty members, external practitioners, and the newly emerging theory and practice of sustainability. In addition to its curricular objectives, the Seminar aims to collectively bond the entering Erb Institute class, both intellectually and socially.
ESENG 503	Energy Systems Engineering Project	Graduate	Sustainability Course	Engineering	This required project course is intended to provide students with a relevant experience in energy systems
AOSS 530	Engineering Climate Change	Graduate	Sustainability Course	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	This seminar aims at gaining a better understanding of global climate change and its possible impacts. Current issues will be discussed, including development of sustainable energy production, biotic and human influences on environmental balance, and strategic approaches to minimizing the impact of global change.
CEE 549	Geoenvironmental Engineering	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Waste generation/disposal; waste types; waste facilities regulations; geoenvironmental site characterization; soil-water-contaminant interactions; design and construction of base and cover containment systems; geosynthetic materials in geoenvironmental applications; landfill settlement and stability; introduction to bioreactor landfills and emerging technologies for waste disposal; technologies for site restoration and cleanup.
CEE 565	Seminars on Energy Systems, Technology and Policy	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Leaders in policy and energy systems engineering discuss cutting-edge technologies, and critical barriers in their disciplines. Speakers range from research leaders, to business leaders, to policy makers. The aim of the seminar series is to provide a view at multiple scales, of challenges in developing and implementing new energy technologies. Industrial, governmental, and research perspectives will be given, on the most promising technologies and policies which will shape our energy portfolio and its environmental consequences, in the decades to come. The need to create sustainable energy systems is a common theme, and the speakers will offer their own perspectives on how policy and technology can be effective in doing so.
CEE 567, ESENG 567	Energy Infrastructure Systems	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Technologies and economics of electric power generation, transmission, and distribution are discussed. Centralized versus distributed generation, and fossil fuels versus renewable resources, are considered in regard to engineering, market, and regulatory principles. Students develop an understanding of energy challenges confronting society and investigate technologies that seek to address future needs.
CEE 591	Environmental Fluid Mechanics	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Fundamentals of fluid mechanics applications to the environment. Gravity and tidal waves. Internal waves and stratified flow. Models for turbulent flow. Effects of the earth's rotation, wind-driven currents and boundary resistance. Mass transfer at interfaces, entrainment and mixing. Flocculation and settling of colloidal particles. Shear dispersion in stream and estuaries.
CEE 592	Biological Processes in Environmental Engineering	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Theoretical principles, qualitative and quantitative description of suspended growth and biofilm processes, as applicable to wastewater treatment and the bioremediation of soils, sediments and groundwater. Bioremediation processes discussed include bioventing and bioparging, in situ intrinsic and enhanced bioremediation of chlorinated and nonchlorinated compounds.
CEE 686, CHE 686, NNSCEN 686	Case Studies in Environmental Sustainability	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Case studies focusing on utilization of principles of environmental sustainability in professional practice. Development of environmental literacy through study of both current and historical environmental issues.
CEE 880	From Motown to Grown town: the Restarting of Stalled Neighborhoods and Idling Land	Graduate	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	The "Paris of the West" was once a booming city, growing to almost 2 million people with no end in sight. The post-WWII suburban growth, rampant highway construction, race riots, white flight, crack epidemics, and years of bureaucracy have left the city in shambles "literally a hulking shell of its former self with a 60% population decline. The city was a one trick pony, betting all chips on an industry that eventually collapsed. Detroit's sprawling nature and rapid decline opens up the huge void of empty buildings and vacant land. Many undereducated, unemployed, poorly nourished, isolated, and "left-behind" residents of Detroit now have the opportunity to shift gears and turn the City's biggest liability into one of mankind's greatest assets "productive agricultural land. While many challenges abound, no other city has the amount of vacant land as does Detroit. People are working to overcome the social, environmental, and political challenges associated with urban agriculture. Hundreds of young people are moving back to the city, attempting to create a new life for themselves. Detroit has the unique opportunity of becoming the first self-sufficient city in America in terms of food, and serve as a new sustainable model of reinvention to the entire nation.
AUTO 533, MECHENG 433	Advanced Energy Solutions	Graduate	Sustainability Course	Engineering Å» Mechanical Engineering, Engineering	Introduction to the challenges of power generation for a global society using thermodynamics to understand basic principles and technology limitations. Covers current and future demands for energy; methods of power generation including fossil fuel, solar, wind, and nuclear; associated detrimental by-products; and advanced strategies to improve power densities, efficiencies and emissions.
AUTO 533, MECHENG 433	Advanced Energy Solutions	Graduate	Sustainability Course	Engineering Å» Mechanical Engineering, Engineering	Introduction to the challenges of power generation for a global society using thermodynamics to understand basic principles and technology limitations. Covers current and future demands for energy; methods of power generation including fossil fuel, solar, wind, and nuclear; associated detrimental by-products; and advanced strategies to improve power densities, efficiencies and emissions.
ESENG 505, MECHENG 571	Energy Generation & Storage Using Modern Materials	Graduate	Sustainability Course	Engineering Å» Mechanical Engineering, Engineering	Energy and power densities previously unattainable in environmentally friendly energy technologies have been achieved through use of novel materials. Insertion of new materials into power supplies has changed the landscape of options. Design strategies for power systems are described, in the context of growing global demand for power and energy.
MECHENG 589	Sustainable Design of Technology Systems	Graduate	Sustainability Course	Engineering Å» Mechanical Engineering, Engineering	Scientific perspectives on grand challenges to environment and society created by the production of energy, water, materials, and emissions to support modern life styles. Integration of economic indicators with life cycle environmental and social metrics for evaluating technology systems. Case studies: sustainable design of consumer products, manufacturing, and infrastructure systems.

Course Number	Title	Level	Level of Sustainability	School/College	Description
LAW 575	Natural Resources Law	Graduate	Sustainability Course	Law	Natural Resources Law provides an overview of American law having to do with the ownership and development of natural resources such as surface water (under both prior appropriations and riparian legal systems), groundwater, wetlands, minerals, forests, wind, solar, fish and wildlife. It covers the development of these resources on private and publicly-owned lands and the relevant environmental safeguards such as the National Environmental Policy Act, Federal Lands Protection and Management Protection Act, Wilderness Act, Endangered Species Act and similar state laws. The course includes an examination of the constitutional protections available to private property owners and of the administrative remedies and processes available to those who would develop and those who would preserve different types of natural resources. There are no prerequisites, although familiarity with property law and constitutional law would be helpful.
LAW 661	Law of Climate Change and Sustainable Development	Graduate	Sustainability Course	Law	Law 661, the Law of Climate Change and Sustainable Development, will focus on ways in which the law is changing in view of likely climate change impacts and to promote sustainable development. It will focus on climate change adaptation (adjusting to the unavoidable impacts of climate change), not climate change mitigation (reducing greenhouse gasses). Thus, this course will not duplicate topics covered in environmental law and energy law courses. Topics to be covered in Law 661 will include emerging developments concerning climate change in business law, such as corporations and securities law, disclosure requirements, fiduciary responsibilities of officers and directors, and insurance law. Legal regimes promoting adaptation to climate change and fostering sustainable development will also be covered, including land use planning (especially in coastal and vulnerable areas), regional transportation planning, stormwater management, and the promotion of "green" buildings through building codes and building efficiency requirements and incentives.
LAW 679	Environmental Law and Policy	Graduate	Sustainability Course	Law	This course addresses legislative, regulatory, and policy efforts to prevent harmful pollution within the practical and political constraints of an industrialized society. The course begins with a consideration of the core concepts involved in environmental protection, including common-law doctrinal antecedents and early efforts to address pollution in the United States. The course then addresses the major federal environmental statutes, including the Resource Conservation and Recovery Act, the Clean Water Act, and the Clean Air Act. We consider doctrinal and theoretical issues in environmental regulation, as well as challenges that emerge in the interpretation, implementation and enforcement of a complex statutory and regulatory scheme. The course includes case studies from the federal environmental program. The course concludes with an introduction to the topic of global climate change.
LAW 682	International Environment Law & Policy	Graduate	Sustainability Course	Law	This course examines how society manages --and sometimes fails to manage-- environmental issues that fall beyond the authority or capability of a single national government. Topics covered in the course will include: *The nature of international environmental issues: context and concepts *Theoretical perspectives and approaches to international environmental problem solving *International environmental lawmaking and general principles *Compliance and dispute resolution *Norms of international environmental protection, including regulatory mechanisms for: climate change; biological diversity and biosafety; the marine environment (living resources and pollution); the polar regions; and hazardous substances and transboundary movement *The relationship between international environmental law and other legal regimes.
LAW 771	How to Save the Planet	Graduate	Sustainability Course	Law	How to save the planet, or, at least, get started trying! This class is a broad survey of the major players and the leading policies of the U.S. environmental movement from the start of the 20th century up to the current day. Beginning with the debates in the early 1900s surrounding the damming of Hetch Hetchy and continuing through the publication of Silent Spring in the 1960s, the course looks at the opposing theoretical impulses underlying environmentalism to set the context for understanding differing perspectives in environmental policy. The course also examines current environmental policy-making, focusing on current proposals in the U.S. Congress concerning global warming and climate change. The final portion of the course examines the steps necessary to achieve a more inclusive environmental movement that involves people of diverse backgrounds and businesses in ways that harness market forces to conserve and protect the environment. The course emphasizes developing skills necessary to be an effective practitioner. There is no final exam and no final paper. Instead, each student will write a 1,000-word paper each week based on that week's readings. Students post their papers to C-tools in advance of each class session
LAW 805	Environmental Justice	Graduate	Sustainability Course	Law	In this seminar we will explore the intersection of social justice and environmental protection. The environmental justice movement coalesced in the early 1980's around allegations that facilities posing environmental risks were disproportionately located in poor communities and communities of color. The movement gained national attention when the United States General Accounting Office and the United Church of Christ Commission for Racial Justice released studies showing a correlation between hazardous waste sites, people of color, and the poor. The Church of Christ study found that race was the most significant factor in predicting the location of a commercial hazardous waste facility; the next most significant factor was income. Controversy--and criticism of the studies--ensued. From these beginnings, we will discuss both the theoretical and practical questions surrounding environmental justice. What types of justice are sought and how can they be measured? How does the environmental justice approach differ from the approach taken by the "traditional" environmental movement? What kinds of strategies and tools (both legal and non-legal) have been employed, and have they been successful? How have federal and state governments responded to environmental justice concerns? Finally, we will consider how the principles of environmental justice have been applied to the pressing issue of climate change.
LAW 840	Advanced Environmental Law	Graduate	Sustainability Course	Law	This seminar will examine advanced environmental law topics at the forefront of current policy debates about how we balance the needs of environmental protection in an industrialized society. The seminar will include an in-depth consideration of the law and policy concerning global climate change. Other topics that may be addressed include the controversy surrounding mountaintop mining removal, how environmental law can address natural disasters like Hurricane Katrina, and selected cross-cutting issues in environmental regulation and enforcement. Students enrolling in the seminar must prepare a final paper regarding one of the issues covered during the semester or another advanced environmental law topic. Students must previously complete either Environmental Law or Environmental Law and Policy (or an equivalent environmental law survey course).
AAS 662, EPID 666	Health & Socioeconomic Development	Graduate	Sustainability Course	Literature, Science, & Arts » Afroamerican and African Studies, Literature, Science, & Arts, Public Health » Epidemiology, Public Health	Reviews links between health conditions and socioeconomic development in low-income countries and trends in health and development indicators; socio-economic determinants of health, including poverty and income, education, nutrition, fertility, and culture and behavior; impact of globalization in terms of neo-liberal policies, trade and capital flows and the urbanization and their growth of the informal economy; examines the effects of health changes on economic growth and development.
ANTHRUCUL 541	Environ Anthropology	Graduate	Sustainability Course	Literature, Science, & Arts » Anthropology, Literature, Science, & Arts	Environmental Anthropology --- Contemporary approaches to environmental anthropology have largely moved from the study of human adaptation to specific environments to research on the causes of environmental degradation. Anthropologists have also shifted their attentions from the ritual regulation of human-environmental relations to context in which competing ideologies about nature are in dialogue. Finally, assumptions about the operation of relatively closed ecosystems have given way to attention to the accelerated circulation of persons, things, and ideas through globalization. Anthropologists interested in political ecology study the institutions and forces that increasingly mediate anthropogenic impacts on the environment.
MATH 550, CMPLXSYS 510	Introduction to Adaptive Systems	Graduate	Sustainability Course	Literature, Science, & Arts » Mathematics, Literature, Science, & Arts, Literature, Science, & Arts » Complex Systems	Sustainability has become a key issue in research and teaching at The University of Michigan. Math 550/CSC 510 will present a systems-based and in-depth examination of the mathematical foundations behind the sustainability of renewable (fish, forests, fauna) and nonrenewable (oil, gas, coal) resources. Since change, resilience to change, evolution, optimality, and trade-offs are central issues in sustainability, focal topics of this course will be the theory and applications of dynamical systems, optimal control theory and game theory. Our systems approach to sustainability will include quite a bit of ecology and economics. Students will use Excel spreadsheets for more complex computations.

Course Number	Title	Level	Level of Sustainability	School/College	Description
NRE 513	Strategies for Sustainable Development	Graduate	Sustainability Course	Nat. Res. and Environment	This course deals with environmental issues from a strategic perspective. It focuses on how environmental pressures (e.g. sustainable development) and environmental problems (e.g. global warming, air pollution, waste-disposal), impact corporate mission, competitive strategy, technology choices, product development decisions, and production processes. Basic concepts of ecology and environmental science are discussed and contrasted to those associated with the traditional economic paradigm.
NRE 533	Negotiating Skills In Environmental Dispute Resolution	Graduate	Sustainability Course	Nat. Res. and Environment	Covers bargaining and negotiation as they can be applied to the resolution of environmental disputes. It will help a student prepare for and carry out a negotiation, become a more effective communicator, and understand the psychological dimensions inherent in negotiation processes. In addition, the courses examines mechanisms for assisting negotiations including facilitation and mediation. The course employs a series of gaming simulations that allow students to engage in controlled bargaining situations, followed by debriefings that critique strategy and styles. In addition, a framework for negotiation analysis is developed that draws on literature in the areas of decision analysis, social psychology, and public policy. This course is a half-term module.
NRE 547	Forest Ecology in a Changing World	Graduate	Sustainability Course	Nat. Res. and Environment	<p>Å In this course we will cover the basic concepts in ecology as they apply to forests in the context of current forest ecology research.Å We will study the biological and ecological bases behind the current challenges forest ecosystems face under global change (i.e., climate change, landscape fragmentation, pollution, introduced species).Å We will also review the role and impact of humans on these communities, focusing on the services forests ecosystems provide and the emergence of urban ecology.</p> <p>Part of the course will involve critical discussions of current literature in the field.Å Students will subscribe to the email alerts of major ecological journals and present summaries of published work related to the topics we are covering to the class on a regular basis.Å</p> <p>Labs will consist on field trips during the first half of semester and wet-labs and computer labs during the second half.Å For these labs we will have the opportunity to collect and analyze field data and then learn about all the steps required in the scientific process.Å The projects will involve sampling of forest biodiversity, estimation of tree species demographic parameters, and measurement of forest carbon pools.Å Data collected in the field will be processed in the lab and analyzed during the computer labs.Å The goal of the computer labs will be to develop basic predictive models that will allow us to forecast the structure and composition of future forests.</p>
NRE 550	Systems Thinking for Sustainable Development and Enterprise	Graduate	Sustainability Course	Nat. Res. and Environment	Systems Thinking for Sustainable Enterprise --- This course develops critical skills of systems thinking and systems dynamics modeling, applies them to challenges of global environmental and social change, and deduces strategic implications for organizations operating globally.
NRE 552	Ecosystem Services	Graduate	Sustainability Course	Nat. Res. and Environment	This course will evaluate the scientific, economic, and socio-political basis for Ecosystem Services.Å Ecosystem Services - sometimes referred to as Earth's 'Natural Capital' - represent the sum of all goods and services that natural and managed ecosystems provide to humanity.Å These services include direct provisioning of goods like food, wood, and freshwater, regulating services such as climate regulation or pest and disease control, and cultural services such as recreation and tourism.Å The idea that ecosystems have natural capital has become increasingly prominent over the past decade as scientists, economists, and politicians have considered how to account for the values of ecosystems that are not included in traditional economic markets.Å This class will explore the ways in which ecosystem services are measured and related to basic ecological processes, how those services are valued and monetized by society, and how services are managed and encouraged by policy and law.Å Theoretical and practical concepts will be reinforced by student-led case studies that provide 'real-world' examples of ecosystem services being valued, including payment for ecosystem services projects, biodiversity offsets, certification schemes, and REDD+.
NRE 560	Behavior&Environmt	Graduate	Sustainability Course	Nat. Res. and Environment	<p>Behavior and Environment --- This course deals with two central themes. First, environmental problems are people problems requiring an understanding of how people think, what they care about, and the conditions under which they behave most reasonably. Second, human behavior makes the most sense when studied in the context of the environment, both present and evolutionary. The course builds a model of human nature based upon research in the field of environmental psychology.</p> <p>The course will explore such topics as environmental perception and knowledge, preferred environments and coping with the failure of preference, and mental attention fatigue and restoration. It then applies this model to such issues as common property resource management and the psychology of sustainability.</p> <p>The course is cross-disciplinary both in emphasis and student population with the disciplines of natural resource policy, planning and management, environmental education, conservation behavior, psychology, landscape architecture and urban planning typically represented.</p>
NRE 563	International Environmental Policy	Graduate	Sustainability Course	Nat. Res. and Environment	The Politics of Nature and Resources in the Developing World --- The objective is to provide students with a survey of the environmental governance mechanisms and the changing landscape of environmental policy that shapes environmental outcomes in the developing world. We aim to involve students closely in reading and learning from assigned readings, encourage participatory learning, and use simulation exercises where appropriate to promote student involvement.
NRE 564	Localization: Transitional Thinking for the New Normal	Graduate	Sustainability Course	Nat. Res. and Environment	However vast were the resources used to create industrial civilization, they were never limitless.Å Biophysical constraints, always a part of human existence, could be ignored for these past few centuries, a one-time era of resource abundance.Å This is no longer possible.Å We can accept that transition to a different live pattern is inevitable, but the form of our response is not preordained.Å The course develops one plausible response called localization.Å It focuses on place-based living within the limits of nearby natural systems.Å The course covers the drivers of localization and examples in practice.Å It also introduces the philosophies of localization and the tools needed to make the transition peaceful, democratic, just and resilient.
NRE 565	Principles of Sustainability	Graduate	Sustainability Course	Nat. Res. and Environment	Principles for Sustainability --- What would an economy, indeed a society, look like if the material security of its citizens and the ecological integrity of its resource base was a top priority? How would it organize itself, structure its industry, shape its consumption? How would a local-global culture operate if no party could solve its environmental problems by displacing costs onto others? What are the conditions in which humans tend not to increase their use of material and energy? To answer questions like these, many people use terms like "sustainability" and "sustainable development." These terms are much debated, much used, and much abused. Some would even say they have lost all meaning. This course addresses these questions and attempts to give meaning to sustainability, both in its implications for reversing trends in environmental degradation and for promoting policies that address long-term, ecological and social goals. It does this by developing a framework of analysis focusing on: i. institutions, formal and informal rules and norms ranging from the local and regional to the international and global; and ii. sustainability, issues of durable resource use, production and consumption, property, development, local-glo
NRE 566	Public Opinion and the Environment	Graduate	Sustainability Course	Nat. Res. and Environment	Examines trends in public opinion on the environment, influences on peoples concerns about the environment, and how such concerns affect personal behaviors and the political process. Specifically, the objectives will be to: 1. Examine the extent of concern for the environment in society. 2. Understand what influences peoples concerns about the environment. 3. Determine whether concern varies for different subgroups in society. 4. Assess the impact peoples concerns have on the actions they take (political actions and personal behaviors). 5. Assess the impact public opinion on the environment has on the political process. 6. Examine the environmental attitudes of policy makers. 7. Predict where public opinion on the environment is likely to head in the future.

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NRE 567	Transportation Engineering & Climate Policy	Graduate	Sustainability Course	Nat. Res. and Environment	This course will give students a solid understanding of the transportation sector as needed to address energy and climate challenges. Topics include: characteristics of the transportation sector (personal vehicles, freight and air); energy and emissions data at global, national and state levels; the structure of transportation markets (for vehicles, fuels and travel demand); and perspectives of businesses, institutions and other sector interests. It will cover past, present and proposed public policies that influence the sector; discuss case studies of key policies; and provide experience with pertinent techniques of energy and environmental analysis. The course will equip students to advise, manage and assist in developing and implementing transportation-related energy and climate programs and policies, and prepare students to excel as analysts, planners, engineers or managers tasked with addressing the subject in industry, government, consultancies and nonprofit organizations.
NRE 568	Reconnect&Revitalize	Graduate	Sustainability Course	Nat. Res. and Environment	Reconnect and Revitalize: Transitional Thinking for the New Normal --- Faced with a great many environmental challenges, it has become urgent that we transition to a sustainable life pattern. While this is a necessary change, it may be a difficult transition at first. There are however, several unexpected aspects to recommend it. The course discusses how a life of voluntary frugality increases the long-term physical and psychological well-being of people. The course examines how the coming transition reconnects people with the natural world in unexpected ways, revitalizing mental clarity, and restoring natural and social systems, especially those that directly provide for our physical sustenance.
NRE 573	Env Footprint & NIOA	Graduate	Sustainability Course	Nat. Res. and Environment	Environmental Footprinting and Input-Output Analysis --- We live in an increasingly interconnected world. The supply chain of products we consume spreads out across the world. Intensified globalization leads to the spatial separation of consumption and environmental impacts embodied in production. Our consumption decisions influence, and are influenced by, productions and environmental systems in other places. It becomes increasingly important for industries and policy makers alike to understand the complex interdependence of consumption, globalized production system, trade, and the environment. Environmental input-output analysis (EIOA) provides a method of examining relationships between industries and evaluating global environmental impacts of consumption and production activities.
NRE 589	Ecological Restoration	Graduate	Sustainability Course	Nat. Res. and Environment	Designed to provide a practical overview of various facets of ecological restoration, particularly as related to restoring and managing the kinds of habitats found in Southeastern Michigan and the upper Midwest. Through a combination of lectures, readings, field trips, and project work, we will examine background theory and issues relating to ecological restoration and attempt to develop approaches for solving specific problems associated with local habitats. While most of the examples we will study will be local, the principles and processes will have applications world-wide.
NRE 593	Environmental Justice: Research & Policy Developments	Graduate	Sustainability Course	Nat. Res. and Environment	Examine current research on the topic of environmental justice, including the evidence concerning the occurrence of environmental injustices, explanation for this phenomenon, and how affected groups and government have responded. The course will also explore solutions to the problem.
NRE 597	Environmental Systems Analysis	Graduate	Sustainability Course	Nat. Res. and Environment	Â This course takes a systems approach to environmental issues, with particular emphasis on problems with conflicting objectives such as economic and environmental concerns. Optimal solutions will be obtained mathematically using a variety of linear and non-linear techniques. Example problems span traditional environmental engineering processes, proactive management of resources, and issues in green design. The purpose of the course is to provide a rigorous mathematical framework for addressing environmental problems. By the end of the course students will be able to define systems and their boundaries, translate problems into mathematical frameworks, apply linear algebra, not appropriate algorithms, optimize systems for a set of constraints and objectives, and define a solution given conflicting objectives.
NRE 592, UP 502	Environmental Planning: Issues & Concepts	Graduate	Sustainability Course	Nat. Res. and Environment, Arch. and U.P. (Taubman) Â» Urban and Regional Planning, Arch. and U.P. (Taubman)	This is an introductory graduate-level course on the issues and concepts underlying environmental policy-making and planning, with a focus on the United States. Rather than concentrating on one particular type of planning method (e.g., cost-benefit analysis, impact assessment, site design), the course is designed to address recurrent value-based and analytical conflicts that cross the array of various environmental policy-making and planning processes employed in the U.S. and abroad. The principal goal of the course is to provide students with the knowledge and skills they will need to be thoughtful and creative professional capable of recognizing the key disjunctions in communication and analysis that often hinder the achievement of effective and satisfying environmental policy and planning solutions. The course is designed to: provide students the ability to recognize and tease apart the competing values and analytical assumptions made by various stakeholders in environmental policy-making and planning debates; consider how those debates are shaped by and play themselves out within the political, legal, and administrative processes that characterize environmental policy-making and planning in the U.S.; and familiarize students with the various forms of contemporary environmental policy-making and planning practice that they will likely encounter in their professional work.
NRE 574, PUBPOL 519, RCNSCI 419	Sustainable Energy Systems	Graduate	Sustainability Course	Nat. Res. and Environment, Public Policy (Ford)	Assessment of the current energy systems that encompasses resource extraction, conversion processes and end-uses. Sustainability is examined by studying global and regional environmental impacts, economics, energy efficiency, consumption patterns and energy policy.
EHS 555	Foundations of Sustainable Food Systems	Graduate	Sustainability Course	Public Health Â» Environmental Health Sciences, Public Health	Foundations of Sustainable Food Systems
EHS 570	Water Quality Management	Graduate	Sustainability Course	Public Health Â» Environmental Health Sciences, Public Health	Principles of science and engineering used in the evaluation and control of water quality. Includes current legislation, types of pollution, sources and nature of pollution, introduction to water quality management practices, water supply and treatment, hydrologic concepts, effects of waste discharge on receiving waters, lake management, and water quality criteria and standards.
EHS 591	Equity Issues in Environmental Health	Graduate	Sustainability Course	Public Health Â» Environmental Health Sciences, Public Health	Examines equity issues in environmental health research and practice. Emphasis will be on the sources of inequity (specific environmental hazards), and documentation of environmental injustice using different spatial scales and time frames. Provides a commentary on the desirability for affected communities to have meaningful input into the design and implementation of environmental health assessment, as well as in the use and communication of the results.
EHS 614	Water & Global Health	Graduate	Sustainability Course	Public Health Â» Environmental Health Sciences, Public Health	Poor water quality, insufficient quantity and inadequate access to water are among the most serious threats to human health worldwide.Â This course analyzes the historical and contemporary roles that water plays on global health.Â Key drivers that affect water quality and quantity (with linkages to human impacts) are investigated, including agriculture, climate change, population growth and urbanization, national resources, international trade, and regional conflicts.Â Both theoretical and practical methods are used to examine real world cases.Â A systems framework is used to develop sustainable and appropriate solutions that consider individual, social, technological, and institutional factors.
EPID 555	Globalization and Health	Graduate	Sustainability Course	Public Health Â» Epidemiology, Public Health	This seminar explores the diverse health impacts of economic, environmental, and cultural globalization. The transnational movement of people, technologies, capital, commodities, toxins, pathogens, ideologies and treatments are affecting people's well-being through diverse pathways. Introductory lectures and discussion of readings will explore various topics related to these issues. We will study the forces of globalization, beneficial and harmful health impacts, role in economic development and resource distribution, and implications for public health practice.
EPID 761	Perspectives in Soc	Graduate	Sustainability Course	Public Health Â» Epidemiology, Public Health	Perspectives in Social Epidemiology --- Social epidemiologists are interested in the distribution of disease in relation gender, race/ethnicity, income/wealth, neighborhoods and other social characteristics. This research is challenging due to many obstacles, from conceptual definitions of the exposures to measurement, statistical modeling and causal inference. This course will provide a wide-ranging discussion of these problems along with modern approaches to overcome them. Topics include directed acyclic graphs, causal modeling, instrumental variables, and multilevel models. Classes will be comprised primarily of lectures and discussions, with analytic examples demonstrated using Stata software.

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EPID 768	Global Health Issues and Dynamics	Graduate	Sustainability Course	Public Health & Epidemiology, Public Health	This course will review the historical development of innovative ideas in public health and international health and will emphasize the importance to understand the transition from humanitarian assistance to international cooperation. We define GLOBAL HEALTH as a dynamic approach of international health based on the analysis of the diversity and trends in the health and living conditions of people and nations, the influence of the political and socioeconomic forces, and the use of this knowledge for the solution of the identified problems. Global Health is concerned not only with pandemics but also with the challenges represented by poverty, environmental degradation, disasters and emergencies and the impact of violence and conflicts. We will review the basic concepts and the present knowledge and approaches to these issues and some of the most influential strategies like: Health Determinants, the Millennium Development Goals, Health as a Bridge for Peace and the new concept of Human Security.
EPID 804, SOC 595	Population Health and Its Determinants	Graduate	Sustainability Course	Public Health & Epidemiology, Public Health	This seminar, involving considerable reading, will introduce students to the emerging area of scholarship and research on the determinants of Population Health and its trends. The focus will be on patterns of health in populations seen from the integration of core findings on inequalities in health, race/ethnicity, community and spatial aspects of health, behavioral and psychosocial factors, lifecourse perspectives, stress biology, and policy/intervention. Thus the seminar will concentrate on multi-level approaches to important health issues. The course is open by permission of the instructors to participants in the Health and Society Scholars program, and advanced doctoral students in public health and other fields.
HBEHD 733	Community-Based Participatory Research	Graduate	Sustainability Course	Public Health & Health Behavior & Education, Public Health	The involvement of community members in research and scholarship has emerged as a critical component for public health research. This doctoral student seminar focuses on the ways in which researchers and community members collaborate to conduct research that leads to community change, and improvement in health and quality of life. Such efforts often call for clarifications and/or redefinitions of: scientists' roles and methods, the knowledge development roles or participating community members, and the varying meaning of "community." Attention will be paid to scholarly debates, practical, and methodological issues in the conduct of community-based participatory research. This seminar will address the major issues and methods involved in conducting community-based participatory research across different disciplines. It provides the opportunity for graduate students from different schools and departments to come together to share perspectives, develop new skills and explore how they can apply this learning to community-based participatory research projects.
PUBPOL 564	Government Regulation of Industry and Environment	Graduate	Sustainability Course	Public Policy (Ford)	Government Regulation of Industry and Environment --- Basic economic principles and methods are used to identify the circumstances in which government intervention can improve industrial efficiency, and to investigate successful and unsuccessful regulatory strategies. The course will cover a range of topics in economic and environmental regulation including natural monopolies, market power and antitrust, market-based environmental policy instruments, and the impact of regulation on technological innovation. Examples will be drawn mainly from electricity and utilities, oil and gas, telecommunications, and transportation industries.
SW 502	Organizational, Community, and Societal Structures	Graduate	Sustainability Course	Social Work	This course examines theory and research knowledge about political economic and societal structures and process related to communities, groups and organizations within contemporary society. Consideration is given to ways in which these social systems have significant social, political, economic, and psychological impacts on the functioning of individuals, families and social groups. The course provides a framework for understanding the influences of medium to large social systems on individuals, families and groups with whom social workers practice. This course will also introduce students to the curricular themes and PODS concepts (i.e. Privilege, Oppression, Diversity, and Social Justice) that are infused in the advanced practice areas. There is a focus on oppression, discrimination, prejudice and privilege and their relationship to social and economic justice for populations served by social workers. This knowledge is considered within a context of social work values and ethics that support the general welfare of all citizens, especially the disadvantaged and oppressed.
SW 613	Behavioral, Psychosocial and Ecological Aspects of Health and Disease	Graduate	Sustainability Course	Social Work	This course will survey the distribution, determinants, and psychological and behavioral aspects of health and disease across the life span. Social, economic, environmental, and cultural variations in and determinants of health, disease, and quality of life will be addressed, including the influence of factors such as race, gender, sexual orientation, and biological and genetic factors. Barriers to access and utilization, geopolitical influences, environmental justice, social injustice and racism, historical trends, and future directions will be reviewed. Health beliefs and models of health behavior will be presented, including help-seeking and utilization of health services. Stress, coping and social support, adaptation to chronic illness, the influences of privilege, stigma and discrimination, quality of life, and death and dying will also be covered.
SW 650	Community Development	Graduate	Sustainability Course	Social Work	This course examines methods of community development as a process in which people join together and develop community-based programs and services at the local level to create community change, with or without assistance by outside agencies. It emphasizes ways in which residents can take initiative, contribute to collective action, and help themselves through community-based business and economic development, health and human services, popular education, and housing and neighborhood revitalization projects. It includes innovative examples of community development in urban and rural areas, as well as examples that involve diverse communities of interest taking into account ability, age, class, color, culture, ethnicity, family structure, gender (including gender identity and gender expression), marital status, national origin, race, religion or spirituality, sex, and sexual orientation. Special emphasis is placed on initiatives which involve individuals and families in positive pluralist and multicultural efforts to integrate human, social, economic, and community development to build upon their strengths and assets rather than focus solely on their problems and needs.
SW 652	Organizing for Social & Political Action	Graduate	Sustainability Course	Social Work	This course examines methods of organizing people for social and political action on their own behalf or on behalf of others. Students will analyze different approaches to bringing people together for collective action, building organizational capacity, and generating power in the community. The course includes the study of skills in analyzing power structures, formulating action strategies, using conflict and persuasive tactics, challenging oppressive structures, conducting community campaigns, using political advocacy as a form of mobilization, and understanding contemporary social issues as they affect oppressed and disadvantaged communities. Special emphasis will be placed on organizing communities of color, women, LGBT populations, and other under-represented groups in U.S. society.
SW 674	Community-Based Policy Advocacy	Graduate	Sustainability Course	Social Work	Community-based policy advocacy will be presented as an empowering process that helps to strengthen intra-group and inter-group solidarity as it challenges and attempts to change oppressive structures, systems, and institutions. In contrast to viewing advocacy in the traditional sense -- as a means by which experts represent group interests in legislative, judicial, and executive settings -- this course will explore ways through which traditionally excluded groups advocate for themselves and, in so doing, help build organizations and develop communities.
SW 814	Community Intervention	Graduate	Sustainability Course	Social Work	Community interventions are examined as methodologies of planned social change and community practice. The changing context of practice, major models, methods, and the uses of empirically based research to formulate and critically evaluate general practice propositions and action guidelines will be analyzed. Models of planned change to be discussed may include mass mobilization, social action, citizen participation, political advocacy, community education, and neighborhood development. Analysis will include methods of assessing community conditions, formulating strategies, building organizations, activating people, implementing plans, and monitoring and evaluating results. Research and case studies in public and private settings, in health, housing, and other human services, and in a variety of territories from neighborhood to nations will be included. Problems and issues of the economically disadvantaged, minorities, and women, and relevant ethical issues and values will be addressed.
ARCH 315	Sustainable Systems I	Undergrad	Sustainability Course	Arch. and U.P. (Taubman) & Architecture, Arch. and U.P. (Taubman)	Sustainable Systems I

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ARCH 357, UP 402	Architecture, Sustainability & the City	Undergrad	Sustainability Course	Arch. and U.P. (Taubman) Å» Architecture, Arch. and U.P. (Taubman), Arch. and U.P. (Taubman) Å» Urban and Regional Planning	An introduction to the design of the built environment, society's largest investment and biggest consumer of energy, the course's focus will range from the room to the building to the city to the metropolis, including spaces and places that are consciously planned and intentionally designed, as well as ones that are vernacular and informal. In addition to Western history, theory and practice of architecture and urban planning, case studies of buildings and cities of different cultures and periods will be presented to deepen the student's understanding of the environmental, economic, socio-cultural and aesthetic impacts of design and urbanism. Contemporary problems and opportunities in sustainable/resilient building and urban design will be considered, including renewable energy, resource and water conservation, and waste management. Livability, walkability, bikeability and transit, as well as the importance of a vibrant, diverse public realm in a healthy community will also be studied.
ARTDES 250	Art/Design Perspectives III: Tech/Environment	Undergrad	Sustainability Course	Art and Design (Stamps)	One of a series of four academic courses that casts a broad net to explore a variety of creative expressions from the mundane to the exotic, the celebrated to the unnoticed, the conceptual to the palpable, the useless to the practical, and the subatomic to the architectural. This third course uses a case study approach to explore the relevance of technology and the environment to artmaking through time and across world cultures. COURSE GOALS Consider the pivotal role of creative persons in a larger context Evaluate your relationship, as a creative person, with both technology and the environment Develop basic environmental literacy as it relates to art and design Evaluate your personal spaces, footprint and environmental history Inform your decision processes for material/energy use and consumption Critique current consumer based media and consumption practices Develop a methodology for evaluating a technology's success / relevance Understand how technology has evolved with human society and why it is unequally distributed across the globe Assess patterns of societal success and failures throughout history Observe and learn the basic functionality of ecosystems Understand the role evolution and diversity play in the environment Understand the role of agriculture and food production in human society Understand the concept of ecological sustainability
ARTDES 367	Sustainability Design	Undergrad	Sustainability Course	Art and Design (Stamps)	Sustainability Design
ARTDES 398	Academic Seminar	Undergrad	Sustainability Course	Art and Design (Stamps)	Sustainable Food
ES 445, STRATEGY 445	Base of the Pyramid: Business Innovation for Solving Society's Problems	Undergrad	Sustainability Course	Business (Ross)	In every country there are people who are very poor by either absolute or relative standards. These individuals at the economic "bottom of the pyramid" lack adequate income, health care, educational opportunities, etc. This course focuses on how business can serve the poor by remedying these conditions and make handsome profits while doing so.
EDCURINS 382, ENVIRON 382	Introduction to Environmental Education for Sustainable Development	Undergrad	Sustainability Course	Education, Literature, Science, & Arts, Literature, Science, & Arts Å» Earth and Environmental Sciences	This course provides students with the knowledge and skills to develop, implement and evaluate environmental education programs. Students will learn about theories, methods, and resources for effective environmental education and practice delivering environmental education lessons. Students also have the opportunity to become certified in Project Learning Tree, Project Wet or Project WILD, three of the most frequently used environmental education curricula in the country.
AOSS 467, CHEM 467, ENSCEN 467, ENVIRON 467, GEOSCI 465	Biogeochemical Cycles	Undergrad	Sustainability Course	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering	Description/discussion of the biogeochemical cycles of water, carbon, nitrogen, and sulfur; the atmosphere and oceans as reservoirs and reaction media; the fate of natural and man-made sources of carbon, nitrogen, and sulfur compounds; the interactions among the major biogeochemical cycles and resultant global change; greenhouse gases, acid rain and ozone depletion.
AOSS 172, ENSCEN 172, ENVIRON 111, GEOG 111, GEOSCI 172, SOC 111	Introduction to Global Change -- Part II	Undergrad	Sustainability Course	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Engineering Å» Civil & Environmental Eng., Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts Å» Geological Sciences, Literature, Science, & Arts Å» Program in the Environment, Literature, Science, & Arts Å» Sociology	Global environmental change encompasses the rapid, interconnected changes now occurring in the Earth system -- its climate, human population, resources, and ecosystems. ENVIRON 111 (Global Change II) is an interdisciplinary, team-taught and web-supported introduction to the human dimensions of global change. You will study the recent, explosive growth of the human population and our impacts on land, air, and water resources, including ecosystems and biological diversity. Energy and climate, which are intimately connected issues, are examined in the context of their histories and especially by looking toward our global future and critical societal decisions that need to be made. To better grasp the challenges of the transition to a more sustainable future, you will study how different groups and cultures have historically interacted with their environment, the post-colonial transformation of human production and consumption, and its interdependence with changing patterns of economic production and distribution. The course concludes with an examination of the major forces of globalization that will shape the future relationship between humans and the resources of our planet.
AOSS 105, CHEM 105, ENSCEN 105, ENVIRON 105	Our Changing Atmosphere	Undergrad	Sustainability Course	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Literature, Science, & Arts Å» Chemistry, Literature, Science, & Arts, Literature, Science, & Arts Å» Earth and Environmental Sciences, Literature, Science, & Arts Å» Program in the Environment	The greenhouse effect, stratospheric ozone depletion, the polar ozone holes, and urban smog are discussed from a scientific perspective using the latest information. Human-induced change in atmospheric composition is a primary vehicle for Global Change. These changes can affect atmospheric motions, including jet streams, fronts and violent storms. The atmosphere interacts with all other components of the environment: the oceans, the geosphere (solid earth), the biosphere (living plants and animals), and the cryosphere (glaciers and ice-caps). These interactions and "feedback mechanisms" are a central theme of this course, which is intended for non-science concentrators.
AOSS 480, NRE 480	Climate Change: The Move to Action	Undergrad	Sustainability Course	Engineering Å» Atmospheric, Oceanic & Space Sciences, Engineering, Nat. Res. and Environment	All sectors of society are affected by climate change: science, policy, business, economics, public health, energy, ecosystems, environmental engineering, journalism, religion, etc. This course explores the intersections of these communities and exposes students the factual and contextual elements that will allow effective participation in the adaptation to climate change.
CEE 265	Sustainable Engineering Principles	Undergrad	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering	Sustainable engineering principles including calculations of environmental emissions and resource consumption. Mass and energy balance calculations in context of pollution generation and prevention, resource recovery, and life-cycle assessment. Economic aspects of sustainable engineering decision-making. Social impacts of technology system design decisions including ethical frameworks, government legislation, and health risks.
CEE 307, ENVIRON 407	Sustainable Cities	Undergrad	Sustainability Course	Engineering Å» Civil & Environmental Eng., Engineering, Literature, Science, & Arts Å» Program in the Environment, Literature, Science, & Arts	As economic and ecological pressures increase, it has become increasingly important that greater efforts be expended to have more sustainable urban environments. Specifically, it is essential that the future operation of cities become more sustainable in terms of energy and resource use, while also safeguarding the health and well-being of local citizens. Urban environments, by their very nature, are complex systems and multiple topics must be simultaneously addressed to ensure the safety and well-being of its residents.
LAW 410	Energy Law and Climate Change	Undergrad	Sustainability Course	Law	In this seminar, we will be learning and discussing the evolving legal issues relating to energy law and clean energy development policy solutions, and the newly emerging law of climate change. This seminar will take place in "real time" while: (1) President Obama and the United States Congress are considering federal climate change solutions legislation; (2) The federal, state and municipal governments are moving to implement the extensive clean energy development policies and financial incentives enacted in late 2008 and early 2009; (3) The private sector is rapidly accelerating investments in cleaner energy and cleaner transportation developments and strategies; and (4) The United States and the global community is preparing for the potentially landmark Copenhagen climate change treaty discussions/negotiations in December 2009. Course requirements are engaged class participation and a final paper (20-30 page) on a seminar-related topic of the student's choice. There are no prerequisites for the seminar, although a previous environmental law or natural resources law class, and constitutional law and administrative law course(s), will be helpful.
STDA BRD 303	Environmental Studies	Undergrad	Sustainability Course	Literature, Science, & Arts	Environment and Sustainable Development in San Jose, Costa Rica --- Students take classes in intensive language, ecology, Latin American political economy, and development theory. They also do fieldwork and an independent research project.
STDA BRD 308	EcoQuest (Whakatikiwai, New Zealand)	Undergrad	Sustainability Course	Literature, Science, & Arts	Students take interdisciplinary coursework in ecology and environment policy. For Spring term, this is combined with fieldwork and a directed research project.
UC 327	Advanced Practicum	Undergrad	Sustainability Course	Literature, Science, & Arts	Sustainability Scholars Interdisciplinary Thinking

Course Number	Title	Level	Level of Sustainability	School/College	Description
UC 427	Capstone Practicum	Undergrad	Sustainability Course	Literature, Science, & Arts	Sustainability Leadership Development This seminar, open only to seniors in the Graham Undergraduate Sustainability Scholars Program, explores the concepts and application of leadership through the lens of sustainability. Through reading seminal works in the field, exploring personal leadership styles and experiences, case studies, and interaction with practitioners, this course seeks to develop sustainability leadership skills and prepare Graham Sustainability Scholars for professional experiences.
WRITING 410	Quantitative Analysis and Writing in the Disciplines	Undergrad	Sustainability Course	Literature, Science, & Arts	The Sustainable Energy Debate - In a various disciplinary iterations, this course provides instructions for logic and reasoning in both numbers and language. Different versions of this course examine numeracy and literacy as they are manifested in the humanities, the natural sciences, and the social sciences.
AAS 365, WOMENSTD 365	Global Perspectives on Gender, Health, and Reproduction	Undergrad	Sustainability Course	Literature, Science, & Arts Afroamerican and African Studies, Literature, Science, & Arts	Feminists and anthropologists have produced voluminous work on the body as a site of gendered and sexualized practices. Building on this rich corpus of literature, the course uses the body as a point of entry to examine the constructions and meanings of gender, health and reproduction and their constitution of social differentiation. By using various cross-cultural examples, we will discuss how gender, racial and class differences are enacted and manifested in the divisions of social spaces and in bodily conduct, function, hygiene and sickness. In its entirety, the course attempts to introduce students to the complexity of the local and global processes underlying the cultural production of gender identities and social differentiation.
AAS 322, ENVIRON 335	Intro Env Politics	Undergrad	Sustainability Course	Literature, Science, & Arts Afroamerican and African Studies, Literature, Science, & Arts, Literature, Science, & Arts Program in the Environment	Analyzes the role of race, gender and class in defining environmental issues and environmental action.
AMCULT 496	Social Science Approaches to American Culture	Undergrad	Sustainability Course	Literature, Science, & Arts American Culture, Literature, Science, & Arts	The world seems to be losing the battle against environmental degradation and, eventually, environmental catastrophe. As an economic superpower, our country is deeply involved in this failure. How have our values, politics, and economic system contributed to this failure? How might we change?
ANTHRBIO 342	Nature/Culture Now!	Undergrad	Sustainability Course	Literature, Science, & Arts Anthropology, Literature, Science, & Arts	This course, co-taught by a biological and a cultural anthropologist, investigates the ongoing power of the nature/culture divide and examines anthropology's central role in formulating the nature/culture dichotomy itself. The course is broken down into four sections including, a history of nature/culture in anthropology, race, sex, and health and disease.
ANTHRBIO 373	Humans & Env Change	Undergrad	Sustainability Course	Literature, Science, & Arts Anthropology, Literature, Science, & Arts	Humans and Environmental Change --- This course examines the interface of human evolutionary biology and ecology throughout the span of our evolutionary history.
ANTHRCUL 440	Environmental Anthropology	Undergrad	Sustainability Course	Literature, Science, & Arts Anthropology, Literature, Science, & Arts	This class examines anthropological approaches to contemporary environmental problems. We will consider what it means to live in a world in which competing ideas about nature are in dialogue with each other. We will study the way that the world is transformed by the accelerated circulation of persons, things, and ideas through globalization. We will also learn about the institutions and forces that increasingly mediate anthropogenic impacts on the environment, including the relationship between corporations and their critics, states and their legal systems, the media, and nongovernmental organizations (NGOs) focused on environmental issues.
ANTHRCUL 256, ENVIRON 256	Culture, Adaptation, and Environment	Undergrad	Sustainability Course	Literature, Science, & Arts Anthropology, Literature, Science, & Arts Program in the Environment	This course explores anthropological approaches to human relationships with their environments and resources. We will examine diverse conceptions of culture and nature, and time and space, and the interaction between contemporary global forces, indigenous societies, and their ecosystems. Particular interest for complementary materialist and culturalist analysis of human-environment relationships, through cultural anthropology case studies of hunting and gathering, pastoralism, farming, commerce, colonialism, modernization, and globalisation issues. We will read several short books about different people, places, and environmental problems (E.E. Evans-Pritchard's "The Nuer"; Colin Turnbull's "The Forest People"; Joe Kane's "Savages..."). These books will not only provide case studies, but will also show us the way cultural anthropology has changed over the years, expanding its range of theories, descriptive practices, and audience on matters of culture, adaptation, and environment. There will also be a selection of articles about the ideas and concepts that are relevant for analyzing changing human-environment relationships, emphasizing today's interactions between economic growth, environmental change, and human health.
BIOLOGY 109	Ecological Knowledge and Environmental Problem Solving	Undergrad	Sustainability Course	Literature, Science, & Arts Biology, Literature, Science, & Arts	Ecological Knowledge and Environmental Problem Solving --- The main point is to gain an understanding of the types of scientific knowledge that are needed to solve environmental problems, and to develop an appreciation of problem-solving skills. This course uses a case study approach, and takes the perspective that science consists of the creation and testing of theory.
BIOLOGY 101, ENVIRON 101	Energy, Food & the Environment	Undergrad	Sustainability Course	Literature, Science, & Arts Biology, Literature, Science, & Arts, Literature, Science, & Arts Program in the Environment	In recent years it has become apparent that current energy and food sourcing is damaging the environment from global warming to pesticide runoff. This course treats the issues of energy, food, and the environment from a biological and sociopolitical point of view. It emphasizes the historical trajectories that generated current conditions and the scientific options for revamping our energy and food systems to make them more consistent with environmental sustainability.
CMPLXSYS 250, PUBPOL 250, ENVIRON 250	Social Systems & Energy	Undergrad	Sustainability Course	Literature, Science, & Arts Complex Systems, Literature, Science, & Arts, Public Policy (Ford), Literature, Science, & Arts Program in the Environment	Energy is an incredibly complex topic by the virtue of the inter-linkages of science, technology, public policy, economics, and human behaviors. This course will examine all aspects of energy: supply and demand, technical and social, with a concerted look at the natural place of social science (behavior, pricing, externalities, social norms) in the energy sphere.
EARTH 102	Energy from the Earth	Undergrad	Sustainability Course	Literature, Science, & Arts Earth and Environmental Sciences, Literature, Science, & Arts	The nature, mode of occurrence, and the technology of exploration and exploitation of energy resources, and their relevance to the present and future world energy needs. Special attention is given to oil, gas, oil shale, tar sands, coal, uranium, and geothermal resources.
EARTH 110	Evolving Oceans	Undergrad	Sustainability Course	Literature, Science, & Arts Earth and Environmental Sciences, Literature, Science, & Arts	Global warming is a key factor determining the state of the world's oceans. The ocean mitigates global warming by absorbing vast quantities of carbon dioxide and heat, but these functions have consequences that include sea level rise, acidification, and altered circulation patterns. Land use and resource extraction also have unique effects on oceanic ecosystems. This course explores the science behind global change in the oceans, concentrating on the issues with the greatest consequence for humans. The course concludes with a discussion of adaptation and mitigation strategies for minimizing impacts on socioeconomic systems.
EARTH 114	Global Warming	Undergrad	Sustainability Course	Literature, Science, & Arts Earth and Environmental Sciences, Literature, Science, & Arts	Review of the geological evidence for global warming including geochemistry of natural and anthropogenic greenhouse gases, global radiation balance, sediment and ice core records, and ancient hot climates with discussion of possible remediation methods and their economic and political context.
EARTH 158	Env Impact Energy	Undergrad	Sustainability Course	Literature, Science, & Arts Earth and Environmental Sciences, Literature, Science, & Arts	Environmental Impact of Energy Systems: What are the Risks? --- This first-year seminar considers the environmental impact of major energy systems: fossil fuels, nuclear power, wind, and solar; and the impact of resource extraction, refining and production, transmission and utilization. Using risk analysis, we compare the energy systems and examine the regulatory framework designed to mitigate negative environmental impacts.
EARTH 159	Toward a Sustainable Human Future	Undergrad	Sustainability Course	Literature, Science, & Arts Earth and Environmental Sciences, Literature, Science, & Arts	Today's human society is faced with a need for adjustments to our changing environment, reconciling social, economic and cultural demands and expectations, while at the same time deriving technological and social solutions to enable the sustenance of cultures and communities from the regional to the global scale. This FYS will use a systems-based approach to examine the natural science that is needed for short- and long-term decision making in support of a sustainable human future. It will use a distinctly interactive approach, requiring reading (both articles and news reports), analysis and presentations. Use and critical analysis of online sources will be encouraged, such as Wikipedia and NYT Environment. Up to 10 project teams will be created that collectively offer a science-based, integrated analysis of the critical issues of societal sustainability. Students are encouraged to collect news reports from daily papers and blogs. Topics that will be addressed include: human population; water access and quality; future energy; climate change; economic resources; ecosystems and biodiversity; food security; and development and urbanization.
EARTH 277	Water in the 21st Century	Undergrad	Sustainability Course	Literature, Science, & Arts Earth and Environmental Sciences, Literature, Science, & Arts	Water sustainability is the number one challenge of the 21st century. Freshwater scarcity is likely to worsen as global climate change intensifies and population growth continues. This class provides students with a solid understanding of the global water cycle and brings students' awareness to the most current challenging water issues.

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EARTH 333	Inexhaustible Seas?	Undergrad	Sustainability Course	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts	Marine Resources and Environmental Issues --- This course explores the mineral, energy and food resources of the ocean and environmental impacts that arise from the exploitation of these resources. We discuss conflicts in our competing uses of the ocean and its resources. We also examine both the popular and scientific literature surrounding these issues.
EARTH 201, GEOSCI 201, ENVIRON 209	Introduction to Physical Geography: The Earth System	Undergrad	Sustainability Course	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts » Geological Sciences, Literature, Science, & Arts » Program in the Environment	This course emphasizes the scientific processes and principles behind global environmental problems. Topics include global biogeochemical cycles, human population, ecosystem management, biogeography, ecological restoration, soil-water-air pollution, environmental health, and energy resources.
EARTH 284, ENVIRON 284	Environmental Geology	Undergrad	Sustainability Course	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	Environmental Geology examines the interactions between today's human society and our dynamic planet. It begins with geologic materials and processes, and goes on to specific topics that include soils, ground water, natural hazards (volcanism, landslides, earthquakes, floods), land surface and sea level, pollution and global warming, energy resources and waste disposal.
EARTH 344, ENVIRON 344	Sust Fossil Energy	Undergrad	Sustainability Course	Literature, Science, & Arts » Earth and Environmental Sciences, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	This course introduces students to concepts and environmental consequences of sustainable and fossil energy sources. The course begins with an introduction to the scientific principles and terminology of the field. Students gain a deeper understanding of the topic through hands-on experiments using alternate energy systems at Camp Davis, which include a combination of solar photovoltaic, solar heating, wind generation and/or hydroelectric. The Camp Davis campus is used as a small experimental » where energy and resource use can be carefully monitored and manipulated by students. In addition, the class travels throughout Wyoming and Idaho visiting and investigating facilities important for power generation. Depending on access during a particular summer, visitations may include a nuclear reactor, hydroelectric generation station, wind farm, solar farm, and/or gas/coal generators. Studies of the ecological consequences of various power options will take the class to additional sites which may include a uranium mine, a coal mine and a natural gas field. Finally students study the ecology of forest growth and succession and deep-well injection to gain an understanding of carbon storage in soils and vegetation, and principles of carbon sequestration
EEB 410	EEB Capstone Seminar	Undergrad	Sustainability Course	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	This course is required of all EEB concentrators and is intended to be taken late in the concentrator »s career after exposure to both basic ecological and evolutionary theory. Priority registration is for senior EEB concentrators. All other interested students will need permission from the instructors to enroll. The course will provide the opportunity for in-depth discussion of the ecological and evolutionary principles underlying important issues in biology and human affairs. Topics will be chosen to illustrate the action (and interaction) of ecological and evolutionary processes, and discussions will explore the theory, empirical evidence, and methodologies relevant to these processes. Readings will be from both peer-reviewed (or primary) and popular literature. Students will be expected to actively participate in discussions, lead discussions, and to write essays or papers on the discussion topics. Each term typically will explore a range of topics drawn from important issues such as emerging diseases, climate change, bioethical questions, early hominid ecology and evolution, conservation biology, environmental problems, speciation, biodiversity, or illustrative case studies in ecology and evolution (e.g., those on Darwin »s finches).
EEB 455	Ethnobotany	Undergrad	Sustainability Course	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts	Ethnobotany is the direct cultural use of plants by people. Ethnobotany is an integrated course utilizing an ecological framework to explore the botany, mycology, anthropology, natural resource management, history, linguistics, and American Indian studies of the human-plant relationships. This course provides an intensive Northern Michigan field botany/mycology experience, followed by an applied ecology laboratory experience to test the constraints and opportunities of specific plants and fungi. Lectures explore the cultural use of plants from a local to global perspective, with a focus on Great Lakes American Indian perspective. Students will learn to identify, classify, harvest, and culturally process many of the Northern Michigan plants utilized for food, medicines, crafts, cordage, firewood, teas, smudging/smoking, and ceremonies during pre- and post- European-American contact. Local American Indian cultural experts will provide several guest lectures and/or applied workshops.
RCIDIV 318, EEB 318, ENVIRON 318	Food, Land, and Society	Undergrad	Sustainability Course	Literature, Science, & Arts » Ecology & Evolutionary Biology, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	The course is an introduction to the modern food system at a time when many of its major trends are in flux. Course topics include the ecology of agricultural ecosystems, the cultural and environmental history of food production, and the current ecological and economic crises in agriculture, especially as they affect native species and ecosystems, climate change, rural communities, and the interconnections between food and agriculture in rich countries and rural livelihoods in the global south. The course integrates scientific, economic, and historical dimensions of modern food production, consumption, and food policies.
ECON 461	The Economics of Development I	Undergrad	Sustainability Course	Literature, Science, & Arts » Economics, Literature, Science, & Arts	Most people live in "poor countries" with much lower average incomes (as well as worse health and education indexes) than the United States and other "rich countries" and most people in all countries live with less than the country average. These disparities have generally continued to widen. This course explores alternative conceptions and theories of economic development, investigates proposed explanations for international variations, and critically compares current strategies for alleviating global poverty and enlarging opportunities for human flourishing, especially for those who are worst off. A recurring further focus is potential implications of global development or its failure for more developed countries.
ECON 462	Economics of Development II	Undergrad	Sustainability Course	Literature, Science, & Arts » Economics, Literature, Science, & Arts	This course is an advanced economics course that focuses on micro-economic issues in developing countries with an emphasis on program evaluation. The course focuses on issues relating to health, HIV/AIDS, gender, household economics, and education with particular attention to empirical analysis and methodologies to address fundamental theoretical and policy relevant questions. Students will take a hands-on approach using STATA with real data to replicate studies that are covered in class. Coursework includes: computer-based problem sets and writing exercises; an original paper based on computer analysis of survey data, and classroom participation.
ECON 370, ENVIRON 375	Environmental & Resource Economics	Undergrad	Sustainability Course	Literature, Science, & Arts » Economics, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	A one-semester introduction to Environmental and Natural Resource Economics. Topics include externalities, unpriced goods, cost-benefit analysis, resource scarcity, exhaustible resource depletion, renewable resource harvesting and common property.
GERMAN 326	Intermediate German - Germany and the Environment	Undergrad	Sustainability Course	Literature, Science, & Arts » Germanic Languages & Literature, Literature, Science, & Arts	One of the most significant challenges faced by the world today is the development and use of regenerative ecologic, economic and social systems to support the continued life of humans and nature on earth. This concept has come to be known as »sustainability«; an idea which at its heart pertains to the preservation and maintenance of resources for present and future generations. Germany has become one of the most significant supporters, developers and practitioners of sustainability. This course will examine how sustainability manifests itself in Germany »s political, social, and economic arenas by providing a brief historical look at the rise of sustainability and examining the impact of sustainability on the everyday lives of Germans. Students will then learn about various areas of concern for sustainability, for example, energy, natural resources, land use, and what Germany has done in these areas (wind energy, water energy, solar energy, nuclear energy, garbage disposal, recycling, land conservation, etc.), through readings, video clips and film.

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HISTORY 445	Topics in History	Undergrad	Sustainability Course	Literature, Science, & Arts » History, Literature, Science, & Arts	Environmental History studies how humans have interacted with nature. This course reaches outside the familiar terrain of American history to include Canada and Mexico to examine the human transformation of the continent. The comparisons focus on the different legacies of empire and environment, which continue to shape conditions in North America. We will ask how nature has shaped patterns of human change in different regions of the continent (British, French, Spanish, and American empires) and how human attitudes toward nature shaped environmental outcomes and institutions in modern nation states. From colonial times to the present, each society has faced questions of sustainability in different ways, and each has developed different approaches to conservation and environmental protection. Before the rise of modern ecology, the awareness of the need to conserve resources emerged slowly, in each society in North America. Some familiarity with American, Canadian, Mexican, or Transatlantic history is helpful. Class will meet each week to discuss assigned readings. The readings will be entirely electronic and consist of electronic books, journal articles and or chapters from larger works that are posted on the course CTools site.
HISTORY 303, AAS 358, AMCULT 301, ENVIRON 304	Topics in History- Environmental History in Detroit	Undergrad	Sustainability Course	Literature, Science, & Arts » History, Literature, Science, & Arts, Literature, Science, & Arts » Afroamerican and African Studies, Literature, Science, & Arts » American Culture, Literature, Science, & Arts » Program in the Environment	Environmental history is the study of how people have both affected and been affected by their physical surroundings over time. In this course, we will learn to look at the world around us with a historical eye, thinking about how local landscapes got the way they are today and how our perceptions of those landscapes are shaped by cultural and social ideas about the environment. We will think about the impacts of global and national processes and events, as well as local changes, on specific sites, and learn how to contextualize environmental changes within broad historical trends. The class gives you a chance to » environmental history, walking through landscapes, asking questions, and analyzing sources while applying the theories and ideas we will learn in class. In early February, the class will take a Saturday field trip to Detroit to meet our community partners and tour some of the neighborhoods, parks, and gardens that make up the city's diverse landscape. For the rest of the academic term, you will work in groups to design and conduct in-depth research on that landscape, culminating in the creation of a multimedia website (using images, maps, text, video/audio, etc.) which will be made available to the Detroit community. You will visit multiple archives and libraries, learn to navigate and analyze a wide range of visual sources, and conduct interviews with long-time residents in the city. Through this project you will come to understand how historical changes in the material world, and the ways people think about that world, have had concrete impacts on peoples' lives. In addition, the websites you create will help local residents better understand the ways in which their city has changed over time and how their personal experiences are connected to larger stories.
HISTORY 222, ENVIRON 221	Global Environmental History	Undergrad	Sustainability Course	Literature, Science, & Arts » History, Literature, Science, & Arts, Literature, Science, & Arts » Program in the Environment	This course is an introduction to environmental history, which combines traditional historical methods with findings from ecology to explore how humans have transformed nature and how nature has shaped human history. It focuses on how human-nature interactions can illuminate key problems in global history (e.g. inter-scalar feedbacks, human agency).
HONORS 135	Ideas in Honors	Undergrad	Sustainability Course	Literature, Science, & Arts » Honors Program, Literature, Science, & Arts	Beyond Sustainability
PHIL 224	Global Justice	Undergrad	Sustainability Course	Literature, Science, & Arts » Philosophy, Literature, Science, & Arts	This interdisciplinary course on global justice, co-taught by faculty from philosophy and economics, integrates approaches from political philosophy and political economy. Foundations of development economics and theories of global justice are introduced and applied to specific issues such as immigration, free trade, and sweatshops.
PHYSICS 210	Energy for our Future	Undergrad	Sustainability Course	Literature, Science, & Arts » Physics, Literature, Science, & Arts	We explore the physics, politics, economics and environmental impact of the production and use of known sources of energy including fossil fuels, nuclear, wind, solar, geothermal and hydroelectric. Students develop a viable energy plan for the future that weighs cost, environmental and human risk, and larger geopolitical impacts.
PHYSICS 481, PUBPOL 481	Science, Technology and Public Policy	Undergrad	Sustainability Course	Literature, Science, & Arts » Physics, Literature, Science, & Arts, Public Policy (Ford)	The course will review the historical role of national science policy in addressing the health, welfare, and security needs of the nation, and will provide an organizational map to help the reader better understand how the federal government develops and executes its science policy and why it funds science. It will explore how universities, national laboratories, and industry partner with the federal government to carry out scientific research, and why states are developing their own scientific and technological support structures. The importance of the public and attention to social values and ethical concerns will also be discussed. The course will examine the interactions between the scientific community and policymakers, and the grand challenges that face science and society, including environmental preservation, advances in new technologies, transportation, power generation, and prevention and cure of diseases.
POLSCI 309	Theoretical Perspectives on Environmental Change	Undergrad	Sustainability Course	Literature, Science, & Arts » Political Science, Literature, Science, & Arts	This course draws upon concepts from Western political theory to examine the political and ethical issues posed by environmental change.
POLSCI 336	Energy Politics	Undergrad	Sustainability Course	Literature, Science, & Arts » Political Science, Literature, Science, & Arts	Meeting the surging energy needs of their citizens represents one of the most daunting challenges facing governments across the world. This course examines the politics of electricity provision, the impacts of natural resource wealth, and environmental politics in both democratic and non-democratic settings, with a special focus on the developing world.
ENVIRON 139	First-Year Seminar in the Environment	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Inquiry into the fundamental changes occurring in the natural environment (including humans) and in human social systems and culture, to explore the question "To what extent, in what ways and why are current trends in human impacts on the environment and social relations unsustainable/sustainable?" The seminar will introduce the major contrasting responses being made to this question along with their differing scenarios of the future in terms of their visions, strategies, and examples of practices to be pursued. Learning resources will be selected from four types of information: scientific, religious/spiritual, documentation of innovative environmental, social (including economic and political) and technological practices and personal experiences and commitments. Religions to be considered include those of Native Americans and other indigenous peoples as well as world religions, e.g., Buddhism, Islam, Judaism, and Christianity. The consideration of spirituality is based on individuals' experiences and recognition of "sacred" or "ultimate" realities that are variously understood and characterized. Students will be asked to engage in interdisciplinary, seminar-based inquiry through reading and thinking critically, reflecting on and analyzing their own values, beliefs and practices, sharing the results of their own inquiries through discussions, writing, and presentations and by comparing and contrasting their own beliefs and ideas with others who have different backgrounds and current values, beliefs, and goals. It is expected that students enrolling in this seminar will have differing backgrounds of knowledge and experience in relation to the environment, science, religion / spirituality, and unsustainability / sustainability. Both students with religious commitments are welcome as well as students who are agnostics, atheists or who would describe themselves as secular humanists, skeptics, and "undecided" or by some other name for their highest values and related belief systems and practices. This opportunity for participatory inquiry will require enrolled students to engage in respectful dialogue along with acceptance of people with backgrounds and present commitments and beliefs that are different from their own.
ENVIRON 207	Sustainability & Society	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course provides students with a broad, interdisciplinary understanding of sustainability in society and establishing a platform from which to further research, study, and put it into practice. Students learn to connect sustainability to real-world challenges, evaluate its claims, develop knowledge to participate in sustainability debates, and identify novel pathways towards a more sustainable society.
ENVIRON 211	Social Sciences and Environmental Problems	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course will introduce students to the range of social sciences and will show how the insights gained from these sciences can help us understand and address environmental problems. The first part of the course will provide an overview of the social sciences. As part of this overview, the perspectives of anthropology, communication/education, economics, political science, sociology, and psychology will be used to examine the causes of and solutions for environmental problems. The second part of the course will focus on two current environmental issues and will explore how the concepts and tools from the social sciences are, or can be, used to address these problems. (The course is designed for first and second year students.)

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ENVIRON 222	Introduction to Environmental Justice	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course explores people of color environmental concerns and specifically focuses on the connection between communities of color and low-income groups and the location of hazardous waste sites. This course also explores Native American environmental issues and the connection between the transboundary shipping of hazardous waste from developed countries to developing ones.
ENVIRON 242	Topics in Environmental Social Science	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This special topics course seeks to examine environmental problems and issues from a social science perspective. Specific social science topics will vary by term.
ENVIRON 270	Our Common Future: Ecology, Economics & Ethics of Sustainable Development	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	An interdisciplinary foundation of the concepts and strategies of sustainability from an ecological, economic, and socio-political perspective. The quest for sustainable development is the most critical, yet challenging, issue of our times. Defining what sustainable development is and how it ought to be accomplished is profoundly influencing government, academics, business, science, and people's culture and livelihoods at the local, national, and global levels.
ENVIRON 290	Food: The Ecology, Economics & Ethics of Growing & Eating	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course engages students in one of the critical environmental and social issues of the 21st century—food—and all that it implies about the sustainability of current practices and emerging trends. Food, or more properly, food systems, has environmental, economic, ethical, and political dimensions. And they intersect with other major issues: health, ecological resilience, biological and cultural diversity, security, justice, democracy. What's more, food is an issue that can be understood in terms of complex systems (natural and human), historical developments, and current practice. The course examines patterns of food production and consumption via histories, case studies and personal accounts, across cultures and across time. It examines the science of agriculture and the culture of growing food and eating food. Special attention is paid to patterns of economic expansion and environmental degradation and to the possibilities for sustainable food systems. A premise is that if society is to get on a sustainable path, it will have to do so first on the ground, in farming, fishing, and irrigating, for instance. And, for that, it will have to organize the distribution and consumption of food to support such efforts. The course thus approaches food from a multitude of perspectives, including those of ecology, economics, history, political science, planning and even some literature and art. The course is structured primarily as a lecture, but has features of a seminar (daily readings and discussion). Students must prepare daily, engage in discussions (including written submissions), and collaborate with each other for research, public presentation and discussion. They must also discipline themselves to just observe.
ENVIRON 302	Topics in Environmental Social Science	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This special topics course seeks to examine environmental problems and issues from a social science perspective. Specific topics will vary by term.
ENVIRON 304	Topics in Culture and Environment	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Writing & Environment
ENVIRON 306	Global Water	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	“Whiskey is for drinking, water is for fighting over.” These famous words, attributed to Mark Twain, summarize perhaps the most critical environmental issue of the coming decades: the scarcity of available freshwater. Today, nearly one billion people—roughly one out of seven people on the planet—are water deprived, meaning they do not have enough freshwater to ensure their basic sanitation, irrigation, or drinking needs. With the world's population expected to grow by 2.5 billion people by 2050 (mostly in areas of the world that are already water deprived), freshwater will be the critical challenge of the 21st century. Overpopulation, urbanization, pollution, food security, corruption, politics, technology, human rights, and governance, just to name a few issues, are all intimately connected to water availability. This course will intertwine these and other issues with four main themes: ensuring human and environmental health, balancing competing demands for freshwater, managing across borders, and coping with climate change.
ENVIRON 308	Sustainability and Health	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course explores how the environment influences health and well-being. In order to tackle this complex topic the physical, psychological, and social dimensions of health are considered. The course then explores how issues like climate change, materialism, and sprawl might impact health and the potential benefits associated with sustainable lifestyles.
ENVIRON 321	Climate Change & Adaptation	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Climate change is the greatest environmental and development challenge facing the world. Course will introduce students to the following: human dimensions of global climate change; key concepts and examples related to impacts, mitigation, vulnerability, resilience, and adaptation; and how government, civil society, and market actors can jointly solve climate problems related to migration, public health, and urbanization.
ENVIRON 350	The Built Environment: Introduction to Landscape Change	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	The content of this course is broad, but critically important for helping informed citizens learn to look at the things we build and the spaces we inhabit. Built environments affect our entire lives, yet we rarely focus on their influence. This course bridges the natural science, social science, and humanities realms anticipated in the Program in the Environment. Course lectures and readings emphasize breadth over depth. Student case study work, however, will develop depth in particular landscape topics. This course is an introduction to the role of humans in shaping the built environment. It explores physical design and cultural meaning at various scales and contexts in the landscape. We explore the power of physical design and planning to enrich the human spirit, provide functional needs, interpret cultural history, and sustain natural systems. The course is concerned with exploring how Americans shape space and how, in turn, space shapes people. We take a topical approach, dealing with different aspects of landscape change, design, and planning. The course illustrates how humans have adapted and shaped landscapes for functional and aesthetic goals. A unifying theme is emphasized throughout: the important link between natural and social processes of landscape change. Landscape design and planning professional skills will not be taught directly; the goal is not to prepare students for landscape architecture practice. This course, however, is designed to encourage students to think about land from many different perspectives.
ENVIRON 361, PSYCH 385, NRE 561	Conservation Behavior: The Psychology Of Environmental Stewardship	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	One enduring challenge of living sustainably on a finite planet is to craft a future in which we will all want to live. A materialistically simpler existence may soon be an ecological necessity. However, it is unlikely to be adopted by many people if it is promoted in the wrong way, as a form of sacrifice requiring compensation, rather than as a choice that is personally meaningful while also being good for the planet. The challenge becomes, then, how to promote sustainable living so that people accept and even embrace it. This course explores the range of behavior change models that are up to this challenge. It focuses on environmental stewardship behaviors that individuals and small groups can adopt and it reviews the effectiveness of commonly used informational and motivational techniques.
ENVIRON 365	International Environmental Policy	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course will examine policy-making on several prominent international environmental issues. Issues examined will include Canada's tar sands, climate change, energy and water consumption and the protection of biological diversity in Papua New Guinea and India. The course will also examine the driving forces that contribute to global environmental burdens, the range of policy and institutional responses potentially available to manage them, and the relationship between international non-governmental agencies and local communities when developing policy.
ENVIRON 367	Global Enterprise and Sustainable Development	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Examines how businesses can influence, and are influenced by, issues related to sustainable development. The course identifies external forces and strategy based reasons that motivate corporations to contribute to environmental and social goals. Through guest lectures and case studies, students learn about current best practice and future possibilities.
ENVIRON 408	Land Use Policy, Law, and the Environment	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	This course provides an overview of the policy and legal justifications for and institutional arrangements used to manage the use and development of land in the U.S., focusing especially on the management of privately owned land by state and local governments for environmental protection purposes.

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ENVIRON 421	Restoration Ecology	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Our landscapes are a product of man's engagement with the natural world. Scientists and citizens, alike, have noticed that many of our landscapes suffer reduced ecological function, and many individuals and groups are responding with efforts to improve the ecological health of these natural areas. This course is intended as a broad overview of restoration ecology in a variety of ecosystems, both local and international. We first focus on using knowledge of ecosystem functioning to facilitate the recovery of disturbed and damaged ecosystems. Then we examine and discuss a multitude of restoration projects—urban, rural, and wild—through the use of case studies, scientific studies, local field trips, and virtual field trips (e.g., documentaries and films). Guest speakers with expertise in aspects of ecological restoration provide opportunities for students to engage more fully in analysis of restoration projects.
ENVIRON 490	War and the Environment: A Lethal Reciprocity	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts	Throughout history warfare and the preparations for war have been an integral aspect of organized societies. This has had complex and fateful impacts on the natural environment. But environmental historians have largely neglected the impacts of military mobilization and collective violence. Conversely, military historians have neglected the environmental impact of war and militarization, although the field of military history has routinely studied the ways in which climate and terrain have shaped warfare. Yet this is a vital aspect of today's challenge to limit the ecological degradation of the biosphere. Since the Vietnam War (in tandem with the rise of the environmental movement) there has been greater public awareness of the environmental consequences of both war itself and also peacetime (Cold War) military establishments. Major research institutes have been monitoring this growing problem, but they have not had much historical depth to inform their work. This provides a dual assignment for environmental history studies: first, to provide a detailed understanding of the ecological consequences of war and militarization over many centuries and in all world regions, and second, to work with contemporary researchers to integrate past perspectives with today's challenges. This course is designed primarily to survey our long history, but week by week we will also be explicitly aware of the contemporary applications of our historical study.
ENVIRON 376, PHIL 376	Environmental Ethics	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts, Literature, Science, & Arts » Philosophy	The fact that humanity's relationship to nature has gone awry is rarely disputed, but the proposed cures are manifold. How should humans value the non-human world? Do humans have ethical duties to entities other than fellow humans? This course investigates a variety of proposed answers that claim to better situate humans with respect to nature. Such systems include variations on anthropocentrism, including a number of e-centric cousins (ecocentrism, biocentrism, zoocentrism, etc.) as well as movements such as deep ecology and ecofeminism. Current questions and controversies will be used to highlight the alternative visions that these various philosophies offer. Also considered will be the components of personal and communal ethics that lead to changes in praxis.
ENVIRON 201, RCNSCI 202	Ecological Issues	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts, Literature, Science, & Arts » Residential College	The environment is defined as the circumstances or conditions that surround an organism, and environmental science as the study of the environment and our proper place in it. These definitions point out the intricacy of understanding environmental science from a scientific, ethical, behavioral, economic, and institutional perspective. This course focuses on ecological principles and concepts underlying the management and use of natural resources, as well as socioeconomic factors and institutional roles. Throughout the course, emphasis is placed on the importance of interdisciplinary approaches to matters concerning the allocation of natural resources and the quality of our environment. Through lectures and discussions, students are encouraged not only to learn about environmental issues but also to consider their personal ethics relating to nature, resource use, and human populations. Topics covered include biodiversity, endangered species, exploitation practices, global fisheries and aquaculture, tropical deforestation, agriculture, air and water pollution, energy production and use, waste disposal, and the role of politics and economics in environmental issues. A particular focus is placed on the role of natural resources in the lives of people from the developed and developing world, and issues relating to environmental justice in the use of resources by people from both regions.
ENVIRON 345, SOC 380	Environmental Public Opinion Analysis	Undergrad	Sustainability Course	Literature, Science, & Arts » Program in the Environment, Literature, Science, & Arts, Literature, Science, & Arts » Sociology	This course examines trends in environmental public opinion, influences on people's concerns about the environment, the depth and strength of concerns, and how environmental concerns affect personal behaviors and the political process. It also introduces students to useful statistical concepts and procedures for analyzing and interpreting public opinion data.
UC 471, PSYCH 411, SOC 471	IGR Senior Capstone: Social Justice in the Real World	Undergrad	Sustainability Course	Literature, Science, & Arts » Psychology, Literature, Science, & Arts, Literature, Science, & Arts » Sociology	The focus is on strategies for social justice and change. The class explores alternative meanings of social justice, theories and strategies for social change, roles of change agents in traditional careers, the assessment of personal skills and resources, discussions with local social justice advocates and practice in multicultural teamwork.
RCIDIV 302	Advanced Issues in Science, Technology, Medicine, and Society: Environmental Literature/Social Justice	Undergrad	Sustainability Course	Literature, Science, & Arts » Residential College, Literature, Science, & Arts	The global environmental justice movement is a €œinspired by activists, artists, teachers, and scholars, and is defined as €œthe right of all people to share equally in the benefits of a healthy environment (Adamson et al). This seminar will consider environmental justice as a social movement, and explore the interconnected meanings of green, sustainability and environment. Weâ€™ll read literature produced in the wake of community disaster, such as: Robert Dugoniâ€™s The Cyanide Canary, about the cyanide poisoning of workers in Idaho; Joe Kaneâ€™s Savages, recounting the Ecuadorian Indiansâ€™ fight to keep oil companies out of their rainforest; Michael Shnayersonâ€™s Coal River, that tells the story of West Virginia communitiesâ€™ efforts against mountain top removal in their backyards, and weâ€™ll learn about the trial of WR Grace, who used asbestos to line the high school track in Libby, Montana. Through these cases and others, weâ€™ll critique the public policy debates at the forefront of issues of environmental justice: access to clean drinking water, hazardous industrial waste, superfund sites and incinerators in the poorest neighborhoods. This class will highlight the latest films from the nationâ€™s Environmental Film Festival and cutting edge analysis from newsmakers. Weâ€™ll host guest speakers from government, community groups, non-profit organizations, and film makers.
RCIDIV 305	The Literature of Environmental and Social Justice	Undergrad	Sustainability Course	Literature, Science, & Arts » Residential College, Literature, Science, & Arts	The global environmental justice movement is a €œinspired by activists, artists, teachers, and scholars, and is defined as €œthe right of all people to share equally in the benefits of a healthy environment (Adamson et al). This seminar will consider environmental justice as a social movement, and explore the interconnected meanings of green, sustainability and environment. Weâ€™ll read literature produced in the wake of community disaster, such as: Robert Dugoniâ€™s The Cyanide Canary, about the cyanide poisoning of workers in Idaho; Joe Kaneâ€™s Savages, recounting the Ecuadorian Indiansâ€™ fight to keep oil companies out of their rainforest; Michael Shnayersonâ€™s Coal River, that tells the story of West Virginia communitiesâ€™ efforts against mountain top removal in their backyards, and weâ€™ll learn about the trial of WR Grace, who used asbestos to line the high school track in Libby, Montana. Through these cases and others, weâ€™ll critique the public policy debates at the forefront of issues of environmental justice: access to clean drinking water, hazardous industrial waste, superfund sites and incinerators in the poorest neighborhoods. This class will highlight the latest films from the nationâ€™s Environmental Film Festival and cutting edge analysis from newsmakers. Weâ€™ll host guest speakers from government, community groups, non-profit organizations, and film makers.
RCSSCI 226	Globalization: Social Theory & Practice	Undergrad	Sustainability Course	Literature, Science, & Arts » Residential College, Literature, Science, & Arts	Current controversies over globalization take place against a background of severe poverty in much of the world, extreme economic and other inequalities between (and within) rich and poor countries, and profound international effects of domestic policies. This course integrates approaches from political economy and political philosophy. Foundations of development economics and theories of global justice are introduced and applied to specific issues such as immigration, free trade, and sweatshops.
RCSSCI 360	Social Science Junior Seminar	Undergrad	Sustainability Course	Literature, Science, & Arts » Residential College, Literature, Science, & Arts	Today, itâ€™s easy to get the impression that only new technologies can solve environmental problems. But in fact many tools and techniques of the past can help achieve sustainability goals. The built environment is an important example, given the massive energy usage, potentially toxic materials, waste generation, and disposal costs of new construction. As preservationists like to say, the greenest building is the one thatâ€™s already built. In this course, students will learn about the history of the preservation movement and its many connections with environmentalism. Case studies and field trips will combine local history with hands-on experiences in historic preservation.

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RCIDIV 316, EEB 316, ENVIRON 316	Introduction to Food Systems	Undergrad	Sustainability Course	Literature, Science, & Arts Å Residential College, Literature, Science, & Arts, Literature, Science, & Arts Å Ecology & Evolutionary Biology, Literature, Science, & Arts Å Program in the Environment	The course introduces the ecology of agricultural ecosystems; the cultural and environmental history of food production, and the current ecological and socio-economic crises in food and agriculture, especially as they affect biodiversity and the sustainability of rural and urban communities.
SOC 203	Sociology of Multiculturalism	Undergrad	Sustainability Course	Literature, Science, & Arts Å Sociology, Literature, Science, & Arts	This course examines conflict solutions in sustainable, structural, and ethical ways, particularly among individuals with membership in groups of diverse class, race/ethnicity, gender, sexual orientation, citizenship, and other identity backgrounds. It explores strategies that could turn stratified, dominant, and unjust differences into differences that enrich social relationships.
SOC 435	Urban Inequality	Undergrad	Sustainability Course	Literature, Science, & Arts Å Sociology, Literature, Science, & Arts	Examines the social and spatial factors affecting the location, social organization, structure and functioning of American cities. Both the internal arrangements and external connections of cities are analyzed. Emphasis is placed on contemporary social problems and spatial processes, such as suburbanization and residential segregation, housing deprivation and neighborhood revitalization, transit system and labor markets, city riots, poverty and the urban underclass.
WOMENSTD 257	Social Science Topics	Undergrad	Sustainability Course	Literature, Science, & Arts Å Women's Studies, Literature, Science, & Arts	Population, Equity, and Environmental Change - This course considers a specific or contemporary social science topic.
ENVIRON 462	Topics in Environmental Social Science	Undergrad	Sustainability Course	Literature, Science, & Arts, Literature, Science, & Arts Å Program in the Environment	This special topics course seeks to examine environmental problems and issues from a social science perspective. Specific social science topics will vary by term.
ENVIRON 462	Topics in Environmental Social Science	Undergrad	Sustainability Course	Literature, Science, & Arts, Literature, Science, & Arts Å Program in the Environment	This special topics course seeks to examine environmental problems and issues from a social science perspective. Specific social science topics will vary by term.
ENVIRON 391, RCIDIV 391	Sustainability & the Campus	Undergrad	Sustainability Course	Literature, Science, & Arts, Literature, Science, & Arts Å Program in the Environment, Literature, Science, & Arts Å Residential College	This Åhands-onÅ interdisciplinary course explores environmental (and, to a lesser degree, social and economic) sustainability in higher education generally and at the University of Michigan specifically in a dynamic, interactive way. Drawing upon theory and practice in sustainability, environmental management, organizational change and social advocacy, students conduct a substantial, hands-on group project in conjunction with a university sponsor. Past projects available at http://graham.umich.edu/leadership/campus-course have led to the creation of the ÅHow to be a Green Wolverine GuideÅ, the planting of a campus garden, a campus sustainability interactive map and many other direct outcomes. Through site visits, guest lectures, discussions, lectures and this project, this course addresses the real life challenges of campus environmental sustainability. The focus is on active, participation-based learning, and students leave the course with an understanding of the campus as a lever for environmental change and with the personal tools to act as change agents. Beyond directly impacting the campus, this course helps develop professional skills in environmental project management.
PUBHLTH 305	The Environment and Human Health	Undergrad	Sustainability Course	Public Health	This course introduces major issues of environmental health science.Å We will examine what those issues are, what determines them, and how they can be altered.Å The course provides an overview for students who want an introduction to environmental health as well as students planning to pursue additional environmental health coursework.
PUBHLTH 350	Global Public Health: Challenges and Transformations	Undergrad	Sustainability Course	Public Health	Public health has taken on increasing global dimensions.Å This course examines the social, economic, and cultural factors impacting the health of societies worldwide and identifies key global health conditions, including obesity, vaccine-reventable diseases, cardiovascular diseases, cancer, tobacco, mental health, HIV/AIDS, TG, and malaria.