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<tr>
<th>Class Code</th>
<th>Course</th>
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<tbody>
<tr>
<td>ABE120</td>
<td>Microcomputing Aplcns</td>
<td>Water flow in soils; closely related problems of solute, pollutant, and heat transfer; emphasis on current concepts and research.</td>
</tr>
<tr>
<td>ABE170A1</td>
<td>Basc Cncept+Watr Rel Appl</td>
<td>This course develops an understanding of natural science concepts and ideas and how they can be used to understand and analyze processes and objects in the every day world. Water is a central theme. Students examine how it is obtained, stored, distributed, used, polluted, and cleaned. They learn to estimate its quality, quantity, energy, and movement. It is a broad introductory course.</td>
</tr>
<tr>
<td>ABE170A2</td>
<td>Sci, Techn+Environment</td>
<td>The scientific method, technology, motion, energy, gases, heat, chemistry, electricity and magnetism are covered in class lectures. In laboratories, students will use physical principles to assess environmental problems and technology: e.g., CAP water, air pollution, solar cookers, and water use in the arid southwest.</td>
</tr>
<tr>
<td>ABE201</td>
<td>Intro to Biosystems Engineeri</td>
<td>This course provides an introduction biosystems engineering with emphasis on biological laboratory skills and basic fabrication, foundations of modeling biological processes, team work and professional skills, and the societal and global context in which the profession is practiced. Discussion topics include internship opportunities, professionalism, engineering ethics, and the impact of engineering on society. Laboratory exercises include renewable energy production, device design and fabrication, and biological sensing. Presentations, discussions, and writing exercises will provide communication experiences.</td>
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<tr>
<td>ABE221</td>
<td>Introduction To Cad</td>
<td>This Wormy World is a course designed to introduce students to various types of parasites and other infectious agents that affect humans and animals around the world.</td>
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<tr>
<td>ABE284</td>
<td>Biosystems Thermal Engr</td>
<td>To become acquainted with and learn basic nutrition concepts including: classification and function of Nutrients, deficiency and toxicity symptoms, digestive processes, feedstuff characterization, and diet formulation for domestic animals. This course will cover everything related to the nutrition and feeding of domestic animals and is intended for both majors needing a prerequisite Animal Nutrition class and non-majors desiring a stand alone course in Animal Nutrition.</td>
</tr>
<tr>
<td>ABE397A</td>
<td>Teaching Workshop</td>
<td>Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential.</td>
</tr>
<tr>
<td>ABE422</td>
<td>Open-Channel Flow</td>
<td>Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential. Graduate-level requirements include an in-depth research paper on the molecular biology/immune response of a single parasite.</td>
</tr>
<tr>
<td>ABE447</td>
<td>Sensors + Controls</td>
<td>Causes and consequences of evolutionary change in pathogens. Evolutionary principles, vertebrate immunity, molecular epidemiology, evolution of virulence, evolution of antimicrobial resistance, predicting epidemics, impacts of infectious disease on host evolution, HIV evolution. Graduate-level requirements include a term paper and an in-class presentation on the same topic.</td>
</tr>
<tr>
<td>ABE455</td>
<td>Soil+Water Rsrs Engr</td>
<td>Introduction to soil and water relationships, irrigation systems, irrigation water supply, and irrigation management; basic designs.</td>
</tr>
<tr>
<td>ABE458</td>
<td>Soil Wtnd Wstewatr Reus</td>
<td>Water quality and system design for agricultural drainage and waste-water systems.</td>
</tr>
<tr>
<td>ABE481A</td>
<td>Engr/Biological Process</td>
<td>The global and surface energy balance; the hydrologic cycle; the influence on climate of the atmospheric and oceanic circulation; climate history, sensitivity, modeling, and natural and anthropogenic change. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter.</td>
</tr>
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</table>
ABE482  Food-Water-Energy Nexus
The climate, landforms, hydrology, soils and vegetation of deserts, with special emphasis on processes and distribution at micro-to-macro scales. Graduate-level requirements include the completion of an oral presentation of an original research paper on an approved topic.

ABE483  Controlled Environ Systm
An introduction to the technical aspects of greenhouse design, environmental control, hydroponic crop production, plant nutrient delivery systems, intensive field production systems, and post-harvest handling and storage of crops.

ABE487  Metagenomics
The influence of nature and humans on arid lands sustainability and the role of locally-adaptable technologies. Various aspects of measuring, monitoring and describing natural and human impacts on arid lands. Focuses on occurrences such as El Nino, population growth, and utilization of limited resources in relation to their economic and environmental significance.

ABE489A  Fab Tech Micro+Nanodevic
Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards.

ABE496A  Smr Engr Career+Profess
Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards. Graduate-level requirements include a comprehensive paper detailing hazards associated with a particular health hazard.

ABE506  Mdlng Mass+Energy Soils
The objective of this course is to prepare you to identify, characterize, and evaluate prevalent soil types in Arizona and to design safe and economical foundations.

ABE522  Open-Channel Flow
An introduction to the chemistry and physics of the troposphere and stratosphere. Topics include natural biogeochemical cycles; atmospheric photochemistry; stratospheric ozone; urban ozone and particulate matter; atmospheric visibility; acid deposition; air pollution meteorology; Gaussian plume model; photochemical model; air quality regulations. Graduate-level requirements include additional homework and other exercises.

ABE526  Watershed Engineering

ABE527  Computer Aplcn:Hydraulic
Computer modeling of surface water hydrology, flood plain hydraulics and water distribution systems. Theoretical basis. Application and design studies. Graduate-level requirements include a research paper or project.

ABE547  Sensors + Controls
Federal Regulatory Agencies affect what food we eat, what drugs we take, how we work, and influence our environment. This course delves into the Environmental Protection Agency (EPA), Occupational Safety and Health Agency (OSHA), Mining Safety and Health Agency (MSHA), and Food and Drug Administration (FDA). The course will emphasize factors that led to the creation, scope, and impact of each agency, its jurisdiction, and each agency's changing influences on society over time. The course will also cover how policy, political pressures, and future trending have had/will have on the regulatory framework for each agency.

ABE555  Soil+Water Rsrcs Engr
Introduction to soil and water relationships, irrigation systems, irrigation water supply, and irrigation management; basic designs. Graduate-level requirements include a special project on a current irrigation topic.

ABE580  Intro to Systems Biology
Examines major health problems of underdeveloped, developed, and emerging nations. Students conduct in-depth analyses of health problems among various populations in multicultural settings, both nationally and internationally.
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<tr>
<td>ABE581A</td>
<td>Engr/Biological Process</td>
<td>This course focuses on the management of natural resources within ecosystems. It introduces students to the management of land and water resources in the context of developing countries. Technical units explore the management and engineering of irrigation systems, water and sanitation, alternative sources for energy, integrated watershed management, and urban and rural land planning. The course also examines the human element of natural resource management as evidenced in resource-tenure systems, environmental policy, indigenous knowledge systems, participatory management practices, and collaborative management for ecosystem services. The course further introduces the student to techniques for monitoring development using remote sensing and geographic information systems, cost benefit analysis for planning, and multi-criteria decision analysis.</td>
</tr>
<tr>
<td>ABE582</td>
<td>Food-Water-Energy Nexus</td>
<td>Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential.</td>
</tr>
<tr>
<td>ABE583</td>
<td>Controlled Environ Systm</td>
<td>An introduction to the technical aspects of greenhouse design, environmental control, hydroponic crop production, plant nutrient delivery systems, intensive field production systems, and post-harvest handling and storage of crops. Graduate-level requirements include submission of a comprehensive report related to a specific greenhouse design project.</td>
</tr>
<tr>
<td>ABE587</td>
<td>Metagenomics</td>
<td>Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters.</td>
</tr>
<tr>
<td>ABE589A</td>
<td>Fab Tech Micro+Nanodevic</td>
<td>Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential. Graduate-level requirements include an in-depth research paper on the molecular biology/immune response of a single parasite.</td>
</tr>
<tr>
<td>ABE696A</td>
<td>Agricultural+Biosys Engr</td>
<td>Causes and consequences of evolutionary change in pathogens. Evolutionary principles, vertebrate immunity, molecular epidemiology, evolution of virulence, evolution of antimicrobial resistance, predicting epidemics, impacts of infectious disease on host evolution, HIV evolution. Graduate-level requirements include a term paper and an in-class presentation on the same topic.</td>
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<tr>
<td>ACBS102L</td>
<td>Intro to Animal Sci Lab</td>
<td>Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters. Graduate-level requirements include a report that synthesizes literature on a research issue of current concern, an in-class presentation and several discussion meetings.</td>
</tr>
<tr>
<td>ACBS102R</td>
<td>Introd to Animal Science</td>
<td>This course is a comprehensive review of the livestock industries and production procedures. The course is team taught with one lead instructor and is designed to allow faculty who have expertise in the various areas teach about those areas.</td>
</tr>
<tr>
<td>ACBS142</td>
<td>Intro Anml Racing Indus</td>
<td>Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential. Graduate-level requirements include an in-depth research paper on the molecular biology/immune response of a single parasite.</td>
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<tr>
<td>ACBS160D1</td>
<td>Hum+Anml Interl Dom-Pres</td>
<td>This course will examine the relationships of humans with animals throughout the ages. From evolution through domestication, the relationships of animals with humans throughout Europe and the New World will be studied. The modern relationships will also be examined and analyzed and compared to those of ancient and historical times.</td>
</tr>
<tr>
<td>ACBS195F</td>
<td>Careers/Veterinary Sci</td>
<td>Introductory and advanced statistical methods and their applications in ecology. Focuses on how research design dictates choice of statistical models; explores principles and pitfalls of hypothesis testing.</td>
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<tr>
<td>ACBS270</td>
<td>Intro Horse Science</td>
<td>This course will study how the articulation of “environmental justice” and “environmental racism” emerged from African-American communities challenging efforts to dump toxic waste in their neighborhoods. And from its start, as a culmination of environmental and Civil Rights rhetoric, how environmental justice has continued to expand as an idea and movement. We will examine how the concept has been enlarged to address the ecological violence experienced by other racial and ethnic minorities in the United States, Native Americans, Latinos, and other groups. Expanding yet further, we will think about how an “environmental inequalities” perspective came to encompass gender, sex, sexuality, and class dimensions. From this historical vantage point, we will consider how environmental injustices are not exclusively a crisis in the United States. More specifically, we will ask how transnational capitalism and industrialization have helped to make inseparable social and environmental inequalities.</td>
</tr>
<tr>
<td>ACBS271A</td>
<td>Trng+Mgmt Of Weanling</td>
<td>Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential.</td>
</tr>
<tr>
<td>ACBS272</td>
<td>Intro Horsemanship Prog</td>
<td>A guided journey through real world environmental law; U.S. legal system, major environmental laws-criminal and civil; common marketplace problems and solutions; high profile cases; essential professional skills.</td>
</tr>
<tr>
<td>ACBS297B</td>
<td>Intr Comptv Lvestck Judg</td>
<td>The global and surface energy balance; the hydrologic cycle; the influence on climate of the atmospheric and oceanic circulation; climate history, sensitivity, modeling, and natural and anthropogenic change. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter.</td>
</tr>
<tr>
<td>ACBS301</td>
<td>Financial+Econ Strategy</td>
<td>A guided journey through real world environmental law; U.S. legal system, major environmental laws-criminal and civil; common marketplace problems and solutions; high profile cases; essential professional skills. Graduate-level requirements include extra term papers and case studies.</td>
</tr>
<tr>
<td>ACBS310</td>
<td>Living In Symbiosis</td>
<td>This course will provide an overview of the diversity of associations that exist between microbes and eukaryotic hosts. The course will span from highly integrated obligatory symbioses to loose associations. Emphasis will be placed on symbiotic associations with relevance to human medicine, veterinary sciences, and agriculture.</td>
</tr>
<tr>
<td>ACBS315L</td>
<td>Psio of Reproduction Lab</td>
<td>Water flow in soils; closely related problems of solute, pollutant, and heat transfer; emphasis on current concepts and research.</td>
</tr>
<tr>
<td>ACBS315R</td>
<td>Psio of Reproduction</td>
<td>Study of the organs of reproduction and their accessories; physiology and endocrinology as related to the process of reproduction and milk secretion.</td>
</tr>
<tr>
<td>ACBS329A</td>
<td>Microbial Diversity</td>
<td>Microbial diversity is a course offered to students in Microbiology, and to other majors with an interest in the remarkable genetic, species-level, phylogenetic, functional, and ecological diversity of prokaryotic and eukaryotic microorganisms.</td>
</tr>
<tr>
<td>ACBS336A</td>
<td>Applied Animal Nutrition</td>
<td>This course offers an overview of U.S. environmental law and policy in historical and geographic context. How has U.S. society used laws to solve environmental problems? We introduce the fundamental elements of the U.S. legal system and the public policy process, as they affect the natural environment and resources. We study key environmental laws, such as the National Environmental Policy Act and the Clean Air Act, and the political geography, court decisions, and policy issues that have shaped their implementation in practice. In addition to environmental law, we discuss different approaches to environmental economics, political economy, and human-environmental relations in order to better understand the wider social and geographic context of environmental regulation. In the last part of the course we study the evolution of electricity law in relation to changing social and environmental priorities, and these cross-cutting themes lead us to look at international environmental problems of global warming and climate change.</td>
</tr>
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</table>
ACBS342  Org+Adm Racing Dept
This second-year colloquium introduces students to various aspects of Geological Engineering. The colloquium covers current research topics, problems of interest to Geological Engineering, and a discussion of requirements for the Bachelor of Science Degree in Geological Engineering. Guest speakers include faculty members from within the department as well as representatives from industry. Student presentations on topics in Geological Engineering are required during the latter portion of the course. Student grades are based on the presentations. This is a Second-Year Colloquium Course.

ACBS345  Racing Laws+Enforcement
The Green Economy. What is it and how does it function? What does it mean for our future? What are the implications for cities, community, and globalization? What kind of policies lay the foundation for green economic development, and what challenges and opportunities lie within? And what does 'green' mean anyway? This course is a challenging exploration into the day-to-day practices and policies of the green economy, particularly in the United States and the Southwest. The class will be devoted to understanding how the green economy functions and why, through readings, lectures, visiting speakers, and field studies.

ACBS371  Sale+Mkt Str Prf+Rc Hors
Studies relating to design determinants for development of outdoor space. Lectures and exercises dealing with individual design criticism including topography, hydrology, climate, and vegetation. Final project summarizing and applying all criteria to a realistic development project is required.

ACBS380  Food Safety and Microbiology
To acquaint the student with contamination and microbiology of foods, and to discuss food safety issues regarding all types of food. The major focus is on procedures to produce safe food products for consumers and for all segments of the food industry.

ACBS400A  Anml Anatomy+Physiology
Integration of airborne and spaceborne remote sensor image data with non-image geographic information system (GIS) data.

ACBS410  Animal Toxicology
The climate, landforms, hydrology, soils and vegetation of deserts, with special emphasis on processes and distribution at micro-to-macro scales.

ACBS419  Immunology
This course examines major issues in comparative and international water policy, including water markets, privatization, dams and river basin management, environmental flows, social equity, and water governance. The course is interdisciplinary and builds on law, geography, political economy, and institutional economics.

ACBS427R  General Mycology
An exploration of the diversity of fungi and fungus like organisms covering general biology and roles as pathogens (of humans and plants), saprobes and symbionts. Fungi as models for eukaryotic molecular research and their uses in industry will be covered.

ACBS442  Rac Bus Strats+Globl Prs
This course is a multi-disciplinary approach to understanding resource access by different people, the institutions and environmental conditions through which resource access is mediated, and the sorts of environmental change that these systems may create. It also involves an analysis of the political institutions that have a bearing on environmental outcomes. It frames local resource use systems within the 'nests' of processes that help to shape them - e.g. political economy, globalization, gender relations, and historically produced 'narratives.'

ACBS443  Research Animal Methods
A geological perspective on current environmental problems, their causes and possible solutions. Focus on surface processes, geohazards, natural resources, and global systems.

ACBS444  Dev+Mgmt Racing Animal
Geology of metallic and nonmetallic ore deposits. Economic considerations, processes of formation, methods of study and exploration, and description of geologic aspects and settings of representative worldwide examples.

ACBS447  Legal Envrmnt/Business
The necessary foundation and a working knowledge of the legal system, regulatory law, employment law, consumer law and international law will be presented and studied. Case studies are used extensively.

ACBS449  Diseases of Wildlife
Important diseases of wildlife. Immunity, disease mechanisms, infectious agents, diagnostic procedures, and post-mortem techniques as well as a survey of selected but generally well-recognized diseases of wildlife.

ACBS464A  Phys Sci for One Health
Principles of gravity, magnetic, seismic and electrical exploration; acquisition and interpretation of data to define geologic structure and evaluate resources.
ACBS467 Computation in Biomedicine  Geology of metallic and nonmetallic ore deposits. Economic considerations, processes of formation, methods of study and exploration, and description of geologic aspects and settings of representative worldwide examples. Graduate-level requirements include an independent study project.

ACBS468A BioEcon, Mkt. & Business  Analysis tools in the time and frequency domains are introduced in the context of sample data sets drawn from ecology, hydrology, climatology and paleoclimatology. Students optionally use their own data in assignments applying methods.

ACBS469A Ethology & Evolution  This course will examine the ways in which different societies have defined, understood, valued, mapped, and made their livings in their environment. Also, it will explore how societies and environments mutually transform one another.

ACBS472 Adv Dairy Herd Management  Does food have a history? While seemingly a mundane aspect of everyday life, food has been central to cultural meaning, political conflict, religious life, and economic and social systems. Food has also been closely connected, both materially and in the realm of ideas, to bodily health and the natural environment, which will be the key themes of this course. Topics may include: the food production and consumption patterns of early America, health and food under slavery, the role of food in the Civil War, the creation of the modern food system, the relationship between food production and landscape change, the shift from local to long-distance food procurement, the transformation of the American diet, the industrialization of agriculture, the relationship between farm labor and poverty, the history of nutritional science and expert advice about what kinds of foods to eat, the development of global commodity chains, the environmental consequences of changes in the food system, the origins of public policy initiatives such as the school lunch and farm programs, and the rise of movements to challenge the conventional food system, such as vegetarianism, organic agriculture, and the local food movement. We will focus on historical experiences in North America, with some attention to their global and comparative context. Through this course, we will explore how a historical perspective can be insightful in understanding the food system.

ACBS475 Equine Enterprises  This course provides an introduction to the practices of service learning and civic engagement through the intersection of academic inquiry and regular participation on one of our Honors Civic Engagement Teams (HCET teams). HCET teams assist both students and the Southern Arizona community by forming student teams that undertake consequential projects to benefit the public good. HCET teams are charged with projects that the host organizations often would be unable to complete with their own resources. We will also develop an understanding for the role that civic engagement plays in concepts and ideals of American citizenship by reading various essays and speeches from preeminent American thinkers, from our nation’s founding through the twentieth century. While we will begin by looking at the historical roots of engaged citizenship and American identity, we will also examine critical responses to nonprofits, community interventions, and NGOs.

ACBS496B Sr Livestck Judging Team  In this course on the urban environment you will investigate the social, environmental, and physical issues in urban design and the practice of living in a city, with Tucson as a case study. We will consider past and present thoughts on successful elements of the urban landscape and discover different perspectives on cultural practices and thought. We will consider some current issues in urban ecology, the impact of leadership on a city as well as current issues in transportation and the city.

ACBS500A Anml Anatomy+Physiology  Water plays a crucial role in the physical, chemical, and biological processes that regulate the Earth system. The relations of physical hydrology are derived from the fundamental laws of physics and chemistry. The water cycle forms the framework for the study of hydrological science. Honors section available.

ACBS510 Animal Toxicology  Water flow in soils; closely related problems of solute, pollutant, and heat transfer; emphasis on current concepts and research.
ACBS519  Gen Immunological Cncepts
Advanced topics in aqueous geochemistry and geomicrobiology will be discussed from current literature. Students will gain an understanding of how waters evolve through, and are influenced by, the hydrologic cycle via reactions with minerals, organic matter, and biologic processes. Strong emphasis on field and laboratory analyses, coupled with geochemical modeling. Course will greatly expand on topics from HWRS 517 and be tailored to students’ research interests.

ACBS527R  General Mycology
Biology of host-parasite relationships with emphasis on parasites of veterinary and human importance. Parasite morphology and physiology, life cycles, epidemiology, pathogenesis and zoonotic potential. Graduate-level requirements include an in-depth research paper on the molecular biology/immune response of a single parasite.

ACBS542  Racing Business+Fin Mgmt
Science is one of the most powerful forces of change in the world. This applied course covers the fundamental elements of producing news reports about science events and issues. We will examine the principles of journalism, the scientific process and the differences between science journalism and science communication. Guest speakers will explore key issues involved in communicating with the public about science. Readings, case studies and discussions will examine issues of balance, scientific uncertainty, accuracy and ethical codes for science journalists. You’ll write professional-quality science articles for general interest and specialized news media. You’ll learn how to gather, evaluate and organize information in ways that will produce accurate, comprehensive information for the public. Each student will write one short piece, and in pairs you’ll research and produce an in-depth article.

ACBS543  Research Animal Methods
Science is one of the most powerful forces of change in the world. This applied course covers the fundamental elements of producing news reports about science events and issues. We will examine the principles of journalism, the scientific process and the differences between science journalism and science communication. Guest speakers will explore key issues involved in communicating with the public about science. Readings, case studies and discussions will examine issues of balance, scientific uncertainty, accuracy and ethical codes for science journalists. You’ll write professional-quality science articles for general interest and specialized news media. You’ll learn how to gather, evaluate and organize information in ways that will produce accurate, comprehensive information for the public. Each student will write one short piece, and in pairs you’ll research and produce an in-depth article. Graduate-level requirements include writing an additional story proposal, query letter and news report plus the in-depth story or multimedia piece will be longer that at the undergraduate-level.

ACBS549  Diseases of Wildlife
Important diseases of wildlife. Immunity, disease mechanisms, infectious agents, diagnostic procedures, and post-mortem techniques as well as a survey of selected but generally well-recognized diseases of wildlife. Graduate-level requirements include a class presentation for which students will review the literature and prepare and present a lecture on a wildlife disease topic to the class.

ACBS567  Computation in Biomedicine
This course will introduce the concepts and techniques used in the growing field of human use management in outdoor recreation settings. The focus is on the sociological dimensions of the recreation experience and an understanding of the principles, practices, and dilemmas of outdoor recreation management in natural areas.

ACBS568A  BioEcon, Mkt. & Business
This course will introduce the concepts and techniques used in the growing field of human use management in outdoor recreation settings. The focus is on the sociological dimensions of the recreation experience and an understanding of the principles, practices, and dilemmas of outdoor recreation management in natural areas. Graduate-level requirements include students to be team leaders during the project phase of the class. They will be expected to learn how to be project coordinators and work with undergraduate students.

ACBS569A  Ethology & Evolution
This course examines major issues in comparative and international water policy, including water markets, privatization, dams and river basin management, environmental flows, social equity, and water governance. The course is interdisciplinary and builds on law, geography, political economy, and institutional economics.
ACBS587 Molecular Endocrinology
This course will examine several themes: conflicts over which government has sovereign control over which resources; the role that tribal governments play in natural resource allocation and management; questions relating to ownership of natural resources; the changing federal policies relating to natural resources allocation; the role of federal courts, Congress, and Executive branches in relation to the trust responsibilities to protect tribal lands and resources; environmental protection, including EPA policy in relation to Indian Reservations; and natural resource development and management.

ACBS696A Research Seminar
Students will learn to integrate knowledge and research approaches from multiple scientific disciplines through five laboratory- and lecture- based modules, including plant ecophysiology, gas exchange, soil and water chemistry, soil microbiology, and multi-scale modeling.

ACCT200 Intro to Financial Acct
This Wormy World is a course designed to introduce students to various types of parasites and other infectious agents that affect humans and animals around the world.

ACCT210 Intro to Managerial Acct
Global climate change is widely considered the greatest threat confronting societies and governments today. This course will cover the scientific evidence of global climate change, the role of science in policy and decision making, major policy options and their ethical implications, and the response of international organizations, businesses and the community to the environmental impacts of this issue.

ACCT250 Survey of Accounting
Survey of environmental management to maximize social benefit.

ACCT310 Cost + Managerial Acct
Introduction to decision-making techniques for natural resources management and planning; includes modeling, economic theory, benefit-cost analysis, input-output analysis, and management science techniques.

ACCT400A Inter Financial Acct
Global climate change is widely considered the greatest threat confronting societies and governments today. Over the last decade a consensus has developed among natural and physical scientists over the likely causes of global climate change. Businesses, governments, and citizens have begun to respond by developing a variety of strategies, policies, and institutional arrangements designed to reduce human contributions to climate change and promote adaptation to the environmental impacts that are beginning to emerge. These policy responses are truly diverse in form and scale, from voluntary carbon markets and business certification programs, to command and control type regulations, to international treaties.

ACCT400B Inter Financial Acct
This course is a survey of environmental management to maximize social benefit. Covering pollution control, nonrenewable resource extraction, and natural resource management, we address both theory and policy in practice to determine when markets work, when they fail, and what policy can do to help. We also discuss the taxonomy of value and introduce stated- and revealed-preference valuation techniques. This course aims to empower students with a set of tools to rigorously evaluate a range of real-world issues at the human-environment nexus through the synthesis of science, economics, and policy. Students taking this course for graduate credit will complete all the required homework and exams with the undergraduates. In addition, they will also complete a 15-20 page research paper.

ACCT400C Inter Financial Acct
Introduction to decision-making techniques for natural resources management and planning; includes modeling, economic theory, benefit-cost analysis, input-output analysis, and management science techniques. Graduate-level requirements include an annotated bibliography of economics-related journal articles related to a topic of interest to the student. Such topics may include natural resource issues, environmental issues, public lands management, or other such issues related to the public economic sector. Bibliography is worth 50 points.

ACCT400E Intermed Acct - Bus Admin Maj
Species adaptability, growth and development, establishment and cultural practices affecting use.

ACCT420 Principles of Federal Taxation
Overview of agricultural productions systems in Yuma, concentrating on vegetable production systems.

ACCT430 Inf Qlt Assur:Mgmt Persp
Environmental interactions of turfgrasses. Adaptability to and cultural amelioration of environmental stress. Pesticide/nutrient fate and management practices to protect the environment.
ACCT451  Analysis Fin Statement
This course will focus on energy policy and energy security understood in the context of global and Eurasian politics and international relations. The course offers different perceptions of energy security in importing and exporting nations, and aims at identifying contemporary developments in providing energy security on global, regional and national levels.

ACCT461  Accounting Info Systems
This course explores how religious traditions shape human relationships with the environment and how the natural world influences religious belief and practice. We will look at a variety of religious traditions and examine how they inform people's understanding of and attitude towards nature.

ACCT472A  Acct Not-For-Profit Ents
Ecosystem services: science and management will examine the ways that ecosystems, and their functions, provide services to human society. Students will learn about and evaluate, strategies for valuing, mapping, and managing ecosystem services. In addition, students will develop skills in scientific communication (reading comprehension, and written and oral presentation).

ACCT500A  Inter Financial Acct
The course aims to provide students with a broad, balanced understanding of fire as a biophysical process. We will explore fire from many perspectives, including physics, ecology, biogeography, management, policy, and economics. The course will strive to make our study of fire interesting and relevant in the contemporary world by examining how such factors as climate change, invasive species, and land use influence how fire interacts with the landscape. We will examine a variety of fire management strategies including fire suppression, prescribed fire, wildland fire use, and landscape restoration ecology. The course will provide a global perspective on fire, with primary emphasis on ecosystems of western North America.

ACCT500B  Inter Financial Acct
This course will introduce the concepts and techniques used in the growing field of human use management in outdoor recreation settings. The focus is on the sociological dimensions of the recreation experience and an understanding of the principles, practices, and dilemmas of outdoor recreation management in natural areas.

ACCT500H  Intermed Financial Accounting
Introduction to decision-making techniques for natural resources management and planning; includes modeling, economic theory, benefit-cost analysis, input-output analysis, and management science techniques.

ACCT500I  Intermediate Accounting II
This course will introduce the concepts and techniques used in the growing field of human use management in outdoor recreation settings. The focus is on the sociological dimensions of the recreation experience and an understanding of the principles, practices, and dilemmas of outdoor recreation management in natural areas. Graduate-level requirements include students to be team leaders during the project phase of the class. They will be expected to learn how to be project coordinators and work with undergraduate students.

ACCT501  Advanced Accounting
Introduction to decision-making techniques for natural resources management and planning; includes modeling, economic theory, benefit-cost analysis, input-output analysis, and management science techniques. Graduate-level requirements include an annotated bibliography of economics-related journal articles related to a topic of interest to the student. Such topics may include natural resource issues, environmental issues, public lands management, or other such issues related to the public economic sector. Bibliography is worth 50 points.

ACCT501I  Advanced Financial Accounting
This course is designed to expose students in the natural sciences and other disciplines to the various forms and practices of science communication and to provide a solid foundation to communicate scientific research to audiences other than fellow scientists in the same field. Held in a seminar-style integrating lecture, presentations, in-class readings, discussions and hands-on activities, the course goes beyond science journalism, i.e. students will learn about opportunities in science communication in other capacities. This course will give students opportunities to practice telling science stories and publish them. Students enrolled for 501 must produce a science feature story that meets the publication requirements for UANews. In addition, 500 level students must prepare an in-class presentation on a topic of their choice. Topics will be presented and discussed at the beginning of the semester.

ACCT520  Intro Federal Taxation
Basic concepts of population studies; analysis of social trends, problems and solutions in relation to environmental factors, with reference to both advanced and developing nations.
This environmental sociology course is designed to provide students with a thorough, comprehensive understanding of the key theories, literature, and issues in environmental sociology. It is most appropriate for Ph.D. students seeking further research in environmental sociology, as well as graduate students and advanced undergraduates with a strong interest in studying the environment/society nexus.

Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters.

Study of lakes and streams; biological characteristics, as related to physical, chemical, geological, and historical processes operating on fresh waters. Graduate-level requirements include a report that synthesizes literature on a research issue of current concern, an in-class presentation and several discussion meetings.

A guided journey through real world environmental law; U.S. legal system, major environmental laws-criminal and civil; common marketplace problems and solutions; high profile cases; essential professional skills.

A guided journey through real world environmental law; U.S. legal system, major environmental laws-criminal and civil; common marketplace problems and solutions; high profile cases; essential professional skills. Graduate-level requirements include extra term papers and case studies.

The development and exchange of scholarly information, in a small group setting, on selected topics in Watershed science and management and Ecohydrology. Course registrants exchange results of research through discussions, reports, and/or papers.

The rich heritage of the Land-Grant mission and the events and people who have influenced and shaped the traditions that are part of the University of Arizona will be explored.

An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.

This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change.

Graduate-level requirements include preparing for and leading a class discussion on a specific topic.

This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change. Graduate-level requirements include increased length of writing assignments.

Basic laws and examples of engineering applications of macroscopic thermodynamics; equations of state; reversible and irreversible processes.
This course is aimed at providing the next generation of multi-disciplinary engineers with a background in clean energy that is based on hydrogen fuel and fuel cell science and technologies. The lectures are designed to pique students' interest in research and applying fuel cell power sources for various applications of electronic devices, aerospace and military missions, and distributed power generation.

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This course will take you on a journey around the world, through many different time periods to look at the ways in which individuals and societies have responded to climate changes and catastrophic environmental events. We will explore evidence from ancient and modern texts, oral histories, art and the archaeological record along with a range of scientific evidence about past environments. We will consider the role of cultural expression in shaping the way societies explain, manage and mitigate for catastrophic change, how the cultural record can be used to inform environmental reconstructions and how climatic and geological ‘catastrophe’ can seed an artistic and poetic renaissance.

With a focus on Latin America, this course examines the historical, comparative, and current dynamics of two global commodities: illicit drugs and oil. These commodities, which depend on a U.S. consumer base, generate unfathomable wealth and unrelenting violence at local, national, and international levels. We will follow them from extraction and production through consumption, examining socioeconomic and environmental impacts, their relationship to state corruption, and possible strategies for responding to the problems they create.

This course introduces a variety of environmental thought linking the political sphere and the biosphere. It examines ecological economics, environmental history and ethics, theoretical ecology, ecofeminism, political ecology in anthropology and intellectual property law.

An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.

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An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic.

Survey of dendrochronological theory and methods. Applications to archaeological, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology.

Introduction to the basic principles in structure, materials and methods of construction and environmental control systems.

Three-module course exploring technological issues relating to small and intermediate scale buildings; including environmental issues of climate/micro-climate and daylighting.

Introduction to the study of the context in which architecture is developed. Course will introduce students to the second of the pre-design studies essential to the understanding of architecture.
ARC421 Building Technology V
Technological issues related to large scale, complex buildings, building code, life safety, design of passive and active environmental control systems.

ARC461D Computer Energy Analysis
A comprehensive course that teaches students energy conservation and passive solar architecture and up-to-date computer energy simulation techniques. The course promotes students learning through field investigation of existing buildings and/or new design projects.

ARC471N Arid Reg Urb
Students will investigate and understand the cultural, historical and environmental dimensions of city-building in arid regions, with an emphasis on the Arizona/Sonora border region.

ARC520F Building Technology VI
Active Environmental Control Systems Technologies (MP&E) related to large scale, complex buildings, building codes, life safety, movement systems, lighting systems, design of passive and active systems.

ARC529 Intro to the Built Environment
An introduction to major cultural and theoretical issues that have shaped the built environment, including aspects of planning, landscape architecture, and architecture, through a series of in-depth, interdisciplinary, thematic explorations.

ARC561D Computer Energy Analysis
A comprehensive course that teaches students energy conservation and passive solar architecture and up-to-date computer energy simulation techniques. The course promotes students learning through field investigation of existing buildings and/or new design projects. Graduate-level requirements include writing short essays on development exercises and presenting simple payback and lifecycle cost analysis on projects.

ARC571N Arid Reg Urb
Students will investigate and understand the cultural, historical and environmental dimensions of city-building in arid regions, with an emphasis on the Arizona/Sonora border region. Graduate students will write a research paper on a topic of their interest, to be determined in consultation with the instructor.

AREC304 Intermed Prod & Consum Anlys
Production and consumption theory and techniques for the analysis of agricultural and resource economics issues.

AREC373 Environmental Economics
Analysis of current environmental problems and their potential solutions.

AREC464 Econ of Policy Analysis
Applied economic theory and method of policy analysis and public choice. Emphasis is on policies impacting agriculture and rural America-especially historical and continuing government intervention in agricultural markets.

AREC596A Agri + Resource Econ
The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.

ARL441A Nat Rsrc Mgmt Native Com
This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change.

ARL541A Nat Rsrc Mgmt Native Com
This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change.
ARL590  Remote Sens Planet Earth  Remote Sensing for the Study of Planet Earth introduces basic and applied remote sensing science as a means to explore the diversity of our planetary environments (biosphere, atmosphere, lithosphere and hydrosphere) within the radiometric, spectral, spatial, angular and temporal domains of remote sensing systems. This survey course strikes a balance between theory, applications and hands-on labs and assignments. We explore how you can download, process, analyze and interpret multi-sensor data and integrate online remotely sensed data sources/products into your research of interest.

ASTR170A1  Plnt Earth:Evl Hab World  This course develops a planetary perspective on the evolutionary processes that shaped Earth throughout history. We will examine why Earth is habitable, that is, why any kind of life can live on it, we will discuss the unique influences that biological processes and atmosphere/ocean systems have on each other, and we will review current notions of climate change, including evidence for the influence of human activities on it. This interdisciplinary treatment of Earth and its sister planets will encourage students to think about how science and engineering must be applied to today's challenges if humankind is to have a promising future on (and off) this planet.

ATMO170A1  Intro Weather+Climate  An introduction to the science of weather processes and climate, including the genesis of fronts and cyclones, precipitation processes, the wind systems of the world, severe storms, and weather forecasting. Special emphasis will be given to natural phenomena which have strong impacts on human activities including tornadoes, hurricanes, El Nino, global warming, ozone depletion, and air pollution. The fundamental importance of physics, chemistry, and mathematics to atmospheric science will be stressed.

ATMO336  Weather,Climate+Society  The course examines basic weather phenomena, climate and climate change, and the associated effects on individuals and societies in the past and present. The possibility and effects of human-caused changes in the climate system are also discussed.

ATMO441A  Dynamic Meteorology I  Thermodynamics and its application to planetary atmospheres, hydrostatics, fundamental concepts and laws of dynamic meteorology.

ATMO451A  Physical Meteorology I  Introduction to atmospheric physics that includes the composition and chemistry of the atmosphere, kinetic theory, the mechanics of ideal and real fluids, aerosol mechanics, atmospheric acoustics, atmospheric radiation, scattering, radiative transfer, atmospheric optics, cloud physics, and atmospheric electricity.

Graduate-level requirements include a more quantitative and thorough understanding of the subject matter.

ATMO469A  Air Pollution I:Gases  An introduction to the chemistry and physics of the troposphere and stratosphere. Topics include natural biogeochemical cycles; atmospheric photochemistry; stratospheric ozone; urban ozone and particulate matter; atmospheric visibility; acid deposition; air pollution meteorology; Gaussian plume model; photochemical model; air quality regulations.

ATMO541A  Dynamic Meteorology I  Thermodynamics and its application to planetary atmospheres, hydrostatics, fundamental concepts and laws of dynamic meteorology. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter.

ATMO551A  Physical Meteorology I  Introduction to atmospheric physics that includes the composition and chemistry of the atmosphere, kinetic theory, the mechanics of ideal and real fluids, aerosol mechanics, atmospheric acoustics, atmospheric radiation, scattering, radiative transfer, atmospheric optics, cloud physics, and atmospheric electricity. Graduate-level requirements include a more quantitative and thorough understanding of the subject matter.

ATMO569A  Air Pollution I:Gases  An introduction to the chemistry and physics of the troposphere and stratosphere. Topics include natural biogeochemical cycles; atmospheric photochemistry; stratospheric ozone; urban ozone and particulate matter; atmospheric visibility; acid deposition; air pollution meteorology; Gaussian plume model; photochemical model; air quality regulations. Graduate-level requirements include additional homework and other exercises.
ATMO590  Remote Sens Planet Earth  Remote Sensing for the Study of Planet Earth introduces basic and applied remote sensing science as a means to explore the diversity of our planetary environments (biosphere, atmosphere, lithosphere and hydrosphere) within the radiometric, spectral, spatial, angular and temporal domains of remote sensing systems. This survey course strikes a balance between theory, applications and hands-on labs and assignments. We explore how you can download, process, analyze and interpret multi-sensor data and integrate online remotely sensed data sources/products into your research of interest.

ATMO596A  Progress in Atmo Science  This is a seminar course that all graduate students are required to take each academic semester. The course consists of invited speakers that will overview progress in different sub-disciplines.

BIOC195E  Careers Science & Math  This colloquium will focus on discussions concerning the wide variety of career opportunities one may consider in the biological and physical sciences and in math. Discussions will include choosing and meeting career goals, unique opportunities in these fields, survival skills for succeeding, classification of one's strengths and weaknesses, evaluation of career options, development of skills in giving presentations, writing a resume, using professionals as a resource, learning about research and seminar opportunities on campus, and making use of advisors and mentors.

BIOC448A  Plant Bioc/Metabolic Eng  Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course.

BIOCS48A  Plant Bioc/Metabolic Eng  Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course. Graduate-level requirements include 2 or 3 short individual oral presentations and a term paper.

CE343  Soil Mechanics  In this course, we will discuss the fundamental physical and mechanical properties of soils and use them in the design of simple foundation and earth retaining systems. We will use certain fundamental principles of solid mechanics and fluid mechanics to describe the mechanical behavior of soils.


CE441  Earth Struc Geotech Engr  Stability analysis for earth slopes, including planar, circular piecewise-linear, and composite-surface methods; analyses for static and steady-flow conditions; earth pressure theories and calculations for generalized conditions; design of rigid and flexible retaining structures; design of braced and tie-back shoring systems; design of reinforced earth walls; computer-aided analysis and design.
and mechanisms of reducing or controlling these risks are discussed.
CPH433 Global Health
Examines major health problems of underdeveloped, developed, and emerging nations. Students conduct in-depth analyses of health problems among various populations in multicultural settings, both nationally and internationally.

CPH484 Fund Industr+Envir Hlth
Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards.

CPH502 Envrmtl Monitoring Meth
Introduction to sampling techniques and analytical methods to measure environmental contamination in the air, water, soils and food. Emphasis on instrument selection and quality control, including documentation, calibration, and sample management.

CPH528 Fund of Global Hlth & Develop
This course examines major health problems of underdeveloped, developed, and emerging nations. Students conduct in-depth analyses of health problems among various populations in multicultural settings, both nationally and internationally.

CPH575 Environ+Occupy Hlth
Course emphasizes health hazard sources, methods to identify & evaluate them, and framework used to effect hazard control. Students will evaluate public health issues, understand research designs, identify and evaluate factors important to the development of monitoring programs.

CPH584 Fund Industr+Envir Hlth
Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards. Graduate-level requirements include a comprehensive paper detailing hazards associated with a particular health hazard.

CPH610 Molecular+Cellular Tox
Molecular and cellular mechanisms of injury by environmental chemicals. Content includes reactive intermediates and oxidants, DNA and protein adducts, DNA repair, rotooncogene activation and tumor suppressor gene inactivation, apoptosis and cell death mechanisms, mechanisms of molecular mutagenesis, stress responses, signaling cascades, cell cycle controls, cell-cell communication and intercellular signaling in injury, and chemical and molecular biomarkers of exposure and injury.

CPH696R Env+Occupatnl Hlth Smr
The development and exchange of scholarly information is best accomplished in small group settings. The seminar will promote critical thinking among students regarding current topics in environmental health and industrial hygiene.

DVP602 Culture in Sustain Development
This course emphasizes the cultural and spatial dimensions to development practice and promotes sensitivity to the unique development practice challenges related to language and culture. Students are exposed to a range of regional contexts and are expected to expand their knowledge and understanding of a specific cultural area. The specific regional themes focus on the impacts of culture on problems related to health and nutrition, natural resource management, governance, and economic decision-making, among other. Faculty from different core competency disciplines will participate in this course.

ECOL182L Intro Biology II Lab
Diversity and evolution of life; structure and function of plants, animals, and organ systems; processes of micro and macroevolution, strategies and selection of different species; phylogenetics and descent

ECOL182R Introductory Biology II
Origin, diversity and evolution of life; physiology of plants, animals and organ systems; processes of micro and macroevolution; animal behavior and ecology of populations and communities emphasizing biotic interactions and biogeography. Designed for biology majors.

ECOL302 Ecology
Single species population biology, competition, predation and mutualism, community and organization, behavioral ecology and evolutionary ecology.

ECOL310 Living In Symbiosis
This course will provide an overview of the diversity of associations that exist between microbes and eukaryotic hosts. The course will span from highly integrated obligatory symbioses to loose associations. Emphasis will be placed on symbiotic associations with relevance to human medicine, veterinary sciences, and agriculture.

ECOL340 Evol Of Plan Form+Funct
The diversity in the interaction between the way organisms are put together ("form") and how they work ("function") in response to environmental challenges. The physiological mechanisms responsible for the flow and transformation of energy and materials within organisms and among organisms framed in the larger context of ecological processes.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Summary</th>
<th>URL</th>
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<tbody>
<tr>
<td>ECOL415R</td>
<td>Insect Biology</td>
<td>Examination of how insects function morphologically, physiologically, and behaviorally. Investigation of relationships between members of Insecta and how they interact with other major taxa, both plant and animal. See <a href="http://ag.arizona.edu/classes/ento415/">http://ag.arizona.edu/classes/ento415/</a> for class information and list of lectures.</td>
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<tr>
<td>ECOL430</td>
<td>Conservation Genetics</td>
<td>Basic methods and theories of genetic/genomic analyses together with the application of these analyses to promote conservation, proper management, and long term survival of free-ranging species, including the exploration of current conservation genetic/genomic literature.</td>
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<tr>
<td>ECOL448A</td>
<td>Plant Bioc/Metabolic Eng</td>
<td>Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course.</td>
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<tr>
<td>ECOL450</td>
<td>Marine Discovery</td>
<td>Participate in this marine biology outreach program for grades 3-8. Undergraduates do all of the instruction in on-campus, inquiry-based workshops featuring marine diversity and conservation with a focus on the nearby Sea of Cortez. You will gain experience in developing your own teaching style, while learning about marine biology. As of June 1, 2009, a current US passport is required of all students taking the course for the trip to Mexico. Course includes one required field trip.</td>
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<tr>
<td>ECOL452</td>
<td>Dryland Ecohydro&amp;Veg Dynamics</td>
<td>Overview of ecological and hydrological interrelationships, including ecologically meaningful water budgets, and associated vegetation dynamics for water-limited, dryland ecosystems.</td>
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<tr>
<td>ECOL474</td>
<td>Aquatic Plants+Enviromnt</td>
<td>The role of riparian areas, estuaries, and constructed wetlands in the environment. Emphasis on plants as wildlife habitat for nutrient cycling and bioremediation.</td>
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<tr>
<td>ECOL479</td>
<td>Art of Scientific Disc</td>
<td>Techniques of posing questions and solving puzzles encountered in scientific research, with emphasis on life sciences and mathematics.</td>
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<tr>
<td>ECOL485</td>
<td>Mammalogy</td>
<td>Systematics, ecology, and evolution of mammals.</td>
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<tr>
<td>ECOL487R</td>
<td>Animal Behavior</td>
<td>Concepts and principles of the mechanism, development, function and evolution of behavior, with emphasis on its adaptiveness.</td>
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<tr>
<td>ECOL496J</td>
<td>Plant Population Ecology</td>
<td>The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.</td>
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<tr>
<td>ECOL497B</td>
<td>Biology Lecture Tutor</td>
<td>Enrolled students serve as peer tutors for ECOL courses, with the goal of promoting independence in student learning. Tutors will work with ECOL faculty and gain leadership and mentoring skills while brushing up on biology (helpful for those about to take MCATs or GREs) and establishing contacts and skills beneficial for future job searches.</td>
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<tr>
<td>ECOL515R</td>
<td>Insect Biology</td>
<td>Examination of how insects function morphologically, physiologically, and behaviorally. Investigation of relationships between members of Insecta and how they interact with other major taxa, both plant and animal. See <a href="http://ag.arizona.edu/classes/ento415/">http://ag.arizona.edu/classes/ento415/</a> for class information and list of lectures. Graduate-level requirements include submission of reports on landmark papers in insect biology.</td>
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<td>ECOL530</td>
<td>Conservation Genetics</td>
<td>Basic methods and theories of genetic/genomic analyses together with the application of these analyses to promote conservation, proper management, and long term survival of free-ranging species, including the exploration of current conservation genetic/genomic literature.</td>
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<tr>
<td>ECOL540</td>
<td>Mechanisms: Plant Development</td>
<td>Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems. Graduate-level requirements include seven journal club discussions and presentations for graduate students and honors undergraduate students.</td>
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This course is open to all readers and writers --- whether of nonfiction, science fiction, literary fiction, fabulism, fantasy, poetry or hybrid --- who are interested in focusing on the topic of the environment. All creative work will deal with the human/environment interface, but within a broad range of possibility and experience. In tandem with the strong emphasis on student writing, we will read extensively across the spectrum of contemporary environmental writers, including selections from Alison Hawthorne Deming (nonfiction), Lydia Millet (fiction), Kim Stanley Robinson (science fiction), and an array of environmentally focused poets. Student compositions will be discussed in a workshop setting.
ENGR422  Engr Sustainable Dev
This course is for students who wish to learn and engage in modern sustainable development practices with respect to engineering projects that have three areas of impact: economic, environmental and societal. The course will provide background for an understanding of the complexities and inter-relations of sustainable development issues. The focus will be on the minerals development industry, and the impacts in industrialized and developing nations, communities and the environment.

ENGR522  Engr Sustainable Dev
This course is for students who wish to learn and engage in modern sustainable development practices with respect to engineering projects that have three areas of impact: economic, environmental and societal. The course will provide background for an understanding of the complexities and inter-relations of sustainable development issues. The focus will be on the minerals development industry, and the impacts in industrialized and developing nations, communities and the environment. Graduate-level requirements include project management duties, where graduate students are expected to manage groups of undergraduates in the design of the final term project. Additional graduate projects and assignments will have requirements for type and quantity of work.

ENTO300  Imp/Desert Cropping Syst
The course will focus on the principles and practices of insect pest management in agricultural crops. IPM concepts and management tactics will be discussed in detail. Case studies of successful pest management programs unique to SW desert cropping systems will be examined.

ENTO310  Living In Symbiosis
This course will provide an overview of the diversity of associations that exist between microbes and eukaryotic hosts. The course will span from highly integrated obligatory symbioses to loose associations. Emphasis will be placed on symbiotic associations with relevance to human medicine, veterinary sciences, and agriculture.

ENTO415R  Insect Biology
Examination of how insects function morphologically, physiologically, and behaviorally. Investigation of relationships between members of Insecta and how they interact with other major taxa, both plant and animal. See http://ag.arizona.edu/classes/ento415/ for class information and list of lectures.

ENVS170A1  Intro Environmental Sci
This course will not be confined to one discipline but rather will include information from physics, chemistry, biology and the social sciences such as economics and anthropology. The central theme of the course will be that of change as a normal and natural process. It will consist of four major focus areas: Biodiversity, Pollution, Population, and Resources. Within each major focus area we shall explore how change has and is occurring at the local, regional and global scales. To facilitate the learning process we shall analyze local, national and international case histories. The case histories would include air pollution at the Grand Canyon, TCE groundwater contamination in Tucson, landfill and leaking underground storage tanks in Tucson, Chernobyl, and the Mt. Graham controversy.

ENVS195A  Careers in Environ Sci
Want to learn about the environment and what environmental scientists do? Want to hear about real environmental science careers from practicing professionals? Want to learn how to use the resources of UA Career Services to find that career for you? Well then, this is the course for you. Join us.

ENVS195D  Water and the Environment
This colloquium will focus on issues related to water, water quality, quantity, water pollution, and water use and their relations to the environment and humans.

ENVS200  Introduction to Soil Science
Fundamental principles of soil science-origin, nature, and constitution of soils; their chemical, physical, and biological properties in relation to plant growth and the non-plant uses of soils.

ENVS201  Soils Laboratory
Laboratory exercises for SWES 200.

ENVS210  Fund Env Sci+Sustain
This course is about how modern science and technology have increased our understanding of the Earth’s environment and improved our ability to solve the important environmental challenges facing humanity, including climate change, pollution, loss of biodiversity, and water shortages. Introduction to remote sensing principles, techniques, and applications, designed principally for those with no background in the field.

ENVS330  Intro to Remote Sensing
[Usually offered Spring, even numbered years] Principles and practices of soil, water and crop management under arid and semiarid conditions; the use of diagnostic procedures for evaluating soils and waters, reclamation, and economics of irrigation project development.
ENVS418  Intr Human Hlth Rsk Asmt  The purpose of this course is to enhance students knowledge and skills related to environmental risk assessment, including hazard assessment, exposure assessment, toxicity assessment, and risk characterization.

ENVS422  Critical Zone Science & Mgmt  This course targets undergraduate science majors and graduates interested in learning more about integrated and interdisciplinary team science while learning about the cross-cutting research and observational strategies employed across NSF’s Critical Zone Observatory network. At least half of the course will focus on guided data analysis based on CZO data sets.

ENVS425  Envir Microbiology  Current concepts in water quality, aerobiology and microbial biogeochemistry.

ENVS430R  Env Monitor+Remediation  The laboratory/field trip part (SWES 430L/530L) focuses on hands-on, laboratory and field experiences design to help the student better understand the principles of and the tools necessary for environmental monitoring. Basic principles and reviewed during lecture (SWES 430R/530R) as necessary to assist the student in connecting theory with hands-on experiences in the lab and the field. Students are required to complete several problems, review publications, and write weekly or bi-weekly reports that summarize each of the nine topics covered, their laboratory/field trip experiences, and provide answers to questions and exercises.

ENVS431A  Tradition Ecological Knowledge  An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.

ENVS441A  Nat Rsrc Mgmt Native Com  This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change.

ENVS464  Environmntl Organic Chem  Physical and chemical processes influencing the behavior of contaminants in the subsurface environment. Includes equilibrium and kinetic theory of solubilation-dissolution, volatilization, sorption, hydrolysis, photolysis, surface catalysis and radioactive decay.

ENVS474  Aquatic Plants+Environmnt  The role of riparian areas, estuaries, and constructed wetlands in the environment. Emphasis on plants as wildlife habitat for nutrient cycling and bioremediation.

ENVS490  Remote Sens Planet Earth  Remote Sensing for the Study of Planet Earth introduces basic and applied remote sensing science as a means to explore the diversity of our planetary environments (biosphere, atmosphere, lithosphere and hydrosphere) within the radiometric, spectral, spatial, angular and temporal domains of remote sensing systems. This survey course strikes a balance between theory, applications and hands-on labs and assignments. We explore how you can download, process, analyze and interpret multi-sensor data and integrate online remotely sensed data sources/products into your research of interest.

ENVS497F  Comm/School Garden Workshop  This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum.
ENVS501  Sustain Mgmt Arid Lands  Principles and practices of soil, water and crop management under arid and semiarid conditions; the use of diagnostic procedures for evaluating soils and waters, reclamation, and economics of irrigation project development. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic.

ENVS518  Intr Human Hlth Risk Asmt  The purpose of this course is to enhance students knowledge and skills related to environmental risk assessment, including hazard assessment, exposure assessment, toxicity assessment, and risk characterization. Graduate-level requirements include conducting a case study that will require them to collect secondary data in the field.

ENVS520  Environmental Physics  An overview of Earth as a planet, including concepts of global scale radiation, heat and water budgets, is presented in the first part of the course. The second part focuses on local scale land-atmosphere exchanges affecting soil temperature, crop water use, and fate of air pollutants. The third part emphasizes individual student and group study of selected topics. Graduate-level requirements include an in-depth research paper on a single aspect of a current topic.

ENVS522  Critical Zone Science & Mgmt  This course targets undergraduate science majors and graduates interested in learning more about integrated and interdisciplinary team science while learning about the cross-cutting research and observational strategies employed across NSF’s Critical Zone Observatory network. At least half of the course will focus on guided data analysis based on CZO data sets. Graduate-level requirements include working with more complex data sets and a 10-page research paper. In general, most seasonal-annual or multi-site data sets will qualify. Please discuss with your instructor prior to turning in a research paper proposal.

ENVS525  Envir Microbiology  Current concepts in water quality, aerobiology and microbial biogeochemistry. Graduate-level requirements include extra journal readings and more comprehensive exams.

ENVS530R  Env Monitor+Remediation  Designed to provide the graduating students and interested graduates with a combination of lectures, labs and field trips that describe relevant topics in environmental monitoring, characterization and remediation. The topics covered include: basic statistics, data quality, field surveying, near-surface air measurement, automated data acquisition, soil, vadose zone and groundwater sampling and monitoring, soil and water biological properties, including pathogen monitoring and remote sensing. This course focuses on hands-on, laboratory and field experiences design to help the student better understand the principles of and the tools necessary for environmental monitoring. Basic principles and reviewed during lecture as necessary to assist the student in connecting theory with hands-on experiences in the lab and the field. Students are required to complete several problems, review publications, and write weekly or bi-weekly reports that summarize each of the nine topics covered, their laboratory/field trip experiences, and provide answers to questions and exercises. Graduate-level requirements include an independent project for an additional 100 points. This project will consist of either a research paper or a special field/data collection/report on topics agreed upon. The exact format and length of this project is to be determined.

ENVS531A  Tradition Ecological Knowledge  An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic.

ENVS541A  Nat Rsrc Mgmt Native Com  This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change. Graduate-level requirements include increased length of writing assignments.
ENVS564  Environmntl Organic Chem  Physical and chemical processes influencing the behavior of contaminants in the subsurface environment. Includes equilibrium and kinetic theory of solubilization-dissolution, volatilization, sorption, hydrolysis, photolysis, surface catalysis and radioactive decay. Graduate-level requirements include a project involving literature research in environmental chemistry.

ENVS574  Aquatic Plats+Environmnt  The role of riparian areas, estuaries, and constructed wetlands in the environment. Emphasis on plants as wildlife habitat for nutrient cycling and bioremediation. Graduate-level requirements include an additional research project and class presentation.

ENVS590  Remote Sens Planet Earth  Remote Sensing for the Study of Planet Earth introduces basic and applied remote sensing science as a means to explore the diversity of our planetary environments (biosphere, atmosphere, lithosphere and hydrosphere) within the radiometric, spectral, spatial, angular and temporal domains of remote sensing systems. This survey course strikes a balance between theory, applications and hands-on labs and assignments. We explore how you can download, process, analyze and interpret multi-sensor data and integrate online remotely sensed data sources/products into your research of interest.

ENVS595  Colloquium  The exchange of scholarly information and/or secondary research. Instruction often includes lectures by several different persons. Research projects may or may not be required of course registrants.

ENVS597F  Comm/School Garden Workshop  This workshop-based course is designed to enable UA undergraduates and graduates to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

ENVS696A  Soils, Water + Envir Sci  The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.

EV260  Envir Stds: Ideas/Institutions  This class analyses the key ideas, individuals, and institutions that have shaped environmental studies and policies in the US and globally. The course provides an introduction to environmental writings that have shaped attitudes to the environment, an overview of the most important US and international institutions that have been established to manage the environment, and the exploration of critical and iconic environmental cases and problems. The course is intended to provide the social science foundations and basic environmental literacy for the degree in environmental studies.

GC170A1  Intro to Global Change  The basics of physical science are presented within the context of global environmental change processes (climatic change, global warming, deforestation, etc.) that impact Earth and its inhabitants. Includes hands-on activities, discussions, computer exercises, and a personal interest project.

GC578  Global Change  Analysis of the Earth system through an examination of its component parts (particularly climate and biogeochemistry) and their interactions with human activities, emphasizing information needed to understand modern and future environmental changes. Graduate-level requirements include an in-depth written exercise and additional activities as described in the syllabus.

GEN330  Intro to Remote Sensing  Introduction to remote sensing principles, techniques, and applications, designed principally for those with no background in the field.
GEN426 Health & Safety in Mining

Fundamental concepts in the recognition, evaluation and control of health and safety hazards encountered in mining operations; includes a review of engineering management responsibilities to control accidents, a review of federal regulations and standards affecting the industrial workplace, and instruction regarding the interaction of industrial hygiene, safety, fire protection and workers' compensation to control losses resulting from industrial accidents.

GEN526 Health & Safety In Mining

Fundamental concepts in the recognition, evaluation and control of health and safety hazards encountered in mining operations; includes a review of engineering management responsibilities to control accidents, a review of federal regulations and standards affecting the industrial workplace, and instruction regarding the interaction of industrial hygiene, safety, fire protection and workers' compensation to control losses resulting from industrial accidents. Graduate-level requirements include a term paper.

GEOG150B1 Human Geography & Global Sys

This course introduces students to fundamental issues and concepts pertinent to the study of individuals and societies. In focusing on models and explanations of how things are interrelated in earth space. Students are given a clearer understanding of the economic, social, and political systems with which individuals live and operate.

GEOG150C1 Environment and Society

This course introduces students to the study of relationships between people and the environment from a social science perspective, and provides a context for thinking about the social causes and consequences of environmental changes in different parts of the world. It focuses on how and why the human use of the environment has varied over time and space; analyzes different approaches to decision-making about environment issues and examines the relative roles of population growth, energy consumption, technology, culture and institutions in causing and resolving contemporary environmental problems around the world.

GEOG170A1 Earth Envr: Intr Phys Geo

Introduction to fundamental laws of nature as expressed physical processes that govern the spatial distribution of Earth's land, sea, air, and biological environments. Focus on fluxes and feedbacks among these systems, and interactions with humans.

GEOG210 Pol+Cult Geog/Globaliz

This course examines how systems of difference provide revealing analytical categories for understanding the political and cultural geography of globalization and develops critical thinking skills that can be used effectively beyond this course.

GEOG230 Our Changing Climate

Where, when, and why is climate changing? We will answer these questions via computer visualization and hands-on exploration of satellite images, time-series, and other climate variability data at global, regional, and local scales, and from paleoclimate to modern instrumental record.

GEOG240 Our Dynamic Landscape

Critical perspectives on complex environmental problems; issues include environmental hazards, renewable and nonrenewable resources; global, regional, and local patterns, and geographic scale are emphasized.

GEOG250 Env & Soc in SW Borderlands

A Tier Two, Individuals and Societies course explores the broader trends shaping the US Southwest and Borderlands, with particular emphasis on the region’s human-environment tradition. It exposes students to a variety of methods for understanding how humans have organized in the Southwest to gain access to resources critical for their survival, both in the past and in the present context. Geog 250, likewise, focuses on the social, cultural, and political dimensions of human-environmental transformation.

GEOG251 Wrld Reg:Comp+Glob Persp

Survey and comparison of major world regions with a focus on how global processes, regional interconnections, and local geographic conditions create distinctive regions and landscapes.

GEOG256 Sustainable Cities+Socs

Urbanization and cities within the sustainability framework. Global urbanization, social justice, environmental equity, growth management, "the new urbanism.” International cases. Web based projects.

GEOG302 Intro to Sustainable Dev

Introduction to Sustainable Development is a foundational course in understanding the policies and strategies that constitute “smart” regional development in US metropolitan areas.

GEOG303 Fld Stdy Enviro Geog

Methods used in environmental geography, including mapping techniques, use of global positioning systems, collection of various types of environmental data and basic data analysis methods.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG304</td>
<td>Water, Environment + Society</td>
<td>The course explores human and natural systems and their dependence on freshwater at multiple scales. Topics of interest include global change, ecosystem services, groundwater, urbanization, land use, watershed and river basin management, stakeholder processes, and water policy.</td>
</tr>
<tr>
<td>GEOG305</td>
<td>Economic Geography</td>
<td>Analysis and modeling of the spatial structure of primary, secondary, and tertiary economic activities; location theory and regionalization in economic systems.</td>
</tr>
<tr>
<td>GEOG330</td>
<td>Intro to Remote Sensing</td>
<td>Introduction to remote sensing principles, techniques, and applications, designed principally for those with no background in the field.</td>
</tr>
<tr>
<td>GEOG357</td>
<td>Geograph Research Method</td>
<td>Formulation and solution of geographic problems; models, research design, and methods of gathering, analyzing, and portraying geographic data.</td>
</tr>
<tr>
<td>GEOG367</td>
<td>Population Geography</td>
<td>Fertility, mortality, and migration as agents of demographic change. Topics include fertility control and LDCs; working mothers and NDCs; aging societies; legal/illegal immigration in the U.S.; population policies.</td>
</tr>
<tr>
<td>GEOG370</td>
<td>Geog of Intrntnl Dvlpmnt</td>
<td>Historical evolution of development theory and current debates in geography of international development. Planned micro to macro-level change over space and time examined related to employment, agriculture, food security, environment, migration and the household.</td>
</tr>
<tr>
<td>GEOG371</td>
<td>Princ+ Prac Regional Dev</td>
<td>Introduction to basic concepts, objectives, practices and techniques of regional and industrial development as a professional activity, with emphasis on development problems and solutions.</td>
</tr>
<tr>
<td>GEOG373</td>
<td>Political Geography</td>
<td>Explores links between global economic and political processes, national affairs and local politics. Designed to foster participation; assessment is via essays and assignments.</td>
</tr>
<tr>
<td>GEOG379</td>
<td>Urban Growth+Development</td>
<td>Location patterns in urban areas and processes of growth; historical development of U.S. cities, rent theory, housing markets, commercial and industrial location, the role of transportation, urban finance, New Urbanist planning and sustainable development concepts.</td>
</tr>
<tr>
<td>GEOG395A</td>
<td>Current Topics/Geography</td>
<td>Exchange of scholarly information and/or primary research through the Department’s regularly scheduled Colloquium Series. Student responsibilities include critical reviews of presentations by local and visiting faculty. This course gives students a broad survey of the latest research within the subdisciplines in Geography.</td>
</tr>
<tr>
<td>GEOG401A</td>
<td>Intro To Planning</td>
<td>This course is designed for advanced undergraduate students seeking careers in urban/regional planning, architecture, real estate development, and related fields. The primary objective of the course is to introduce students to the planning profession and the tracks of study within the University of Arizona's Planning Degree Program. Some of the topics covered during the semester include: the scope and objectives of urban planning; the evolution of the city and the profession of planning; ethics in planning; the place of planning within the government and the law; and selected topics of interest to planners.</td>
</tr>
<tr>
<td>GEOG403</td>
<td>Appl Geog Info Sys</td>
<td>General survey of principles of geographic information systems (GIS); applications of GIS to issues such as land assessment and evaluation of wildlife habitat; problem-solving with GIS.</td>
</tr>
<tr>
<td>GEOG404</td>
<td>The Politics Of Nature</td>
<td>Surveys political problems in environment/society relations by exploring the history of geographic theory surrounding environmental politics, surveying the local and global actors in conflicts, and addressing questions of biodiversity loss, forest conservation, and urban hazards.</td>
</tr>
<tr>
<td>GEOG417</td>
<td>Geog Inf Sys/Nat+Soc Sci</td>
<td>Introduction to the application of GIS and related technologies for both the natural and social sciences. Conceptual issues in GIS database design and development, analysis, and display.</td>
</tr>
<tr>
<td>GEOG431A</td>
<td>Tradition Ecological Knowledge</td>
<td>An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.</td>
</tr>
</tbody>
</table>
GEOG462  Env. Law, Geography & Society  This course offers an overview of U.S. environmental law and policy in historical and geographic context. How has U.S. society used laws to solve environmental problems? We introduce the fundamental elements of the U.S. legal system and the public policy process, as they affect the natural environment and resources. We study key environmental laws, such as the National Environmental Policy Act and the Clean Air Act, and the political geography, court decisions, and policy issues that have shaped their implementation in practice. In addition to environmental law, we discuss different approaches to environmental economics, political economy, and human-environmental relations in order to better understand the wider social and geographic context of environmental regulation. In the last part of the course we study the evolution of electricity law in relation to changing social and environmental priorities, and these cross-cutting themes lead us to look at international environmental problems of global warming and climate change.

GEOG490  Remote Sens Planet Earth  A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science.

GEOG497F  Comm/School Garden Workshop  This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum.

GEOG501A  Intro To Planning  This course is designed for advanced undergraduate students seeking careers in urban/regional planning, architecture, real estate development, and related fields. The primary objective of the course is to introduce students to the planning profession and the tracks of study within the University of Arizona’s Planning Degree Program. Some of the topics covered during the semester include: the scope and objectives of urban planning; the evolution of the city and the profession of planning; ethics in planning; the place of planning within the government and the law; and selected topics of interest to planners. Graduate-level requirements include one additional project and leading in-class exercises.

GEOG503  Appl Geog Info Sys  General survey of principles of geographic information systems (GIS); applications of GIS to issues such as land assessment and evaluation of wildlife habitat; problem-solving with GIS. Graduate-level requirements include completion of a project on the use of GIS in their discipline or an original GIS analysis (100 points) in coordination with the instructor.

GEOG517  Geog Info Sys/Nat+Soc Sci  Introduction to the application of GIS and related technologies for both the natural and social sciences. Conceptual issues in GIS database design and development, analysis, and display. Graduate-level requirements include a thorough bibliographic review and a scholarly paper on a current application of geographic information systems in the student’s major field.

GEOG531A  Tradition Ecological Knowledge  An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic.
GEOG539A Intro Dendrochronology
Survey of dendrochronological theory and methods. Applications to archaeological, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology.

GEOG578 Global Change
Analysis of the Earth system through an examination of its component parts (particularly climate and biogeochemistry) and their interactions with human activities, emphasizing information needed to understand modern and future environmental changes. Graduate-level requirements include an in-depth written exercise and additional activities as described in the syllabus.

GEOG590 Remote Sens Planet Earth
A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science.

GEOG597F Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

GEOG597S Sustain Develop & New Urbanism
Examines contemporary competition between environment, resources (water, energy), social equity, and economic viability in the community development and revitalization arena. Public policy, planning initiatives, design strategies and technical solutions that bridge the conflicting agendas are analyzed. Field investigation of contemporary cases. Appropriate for students specializing in planning, architecture and landscape architecture.

GEOS170A1 Earth: From Birth to Death
Students will learn that a few universal laws describe the behavior of our physical surroundings, from the universe to every action in our daily lives. this interdisciplinary course will cover aspects of the scientific process, astronomy, physics, chemistry, and Earth sciences, with an emphasis on geosciences and society, including earthquakes, mass extinctions in geologic history, and global warming. It will give students the ability to read and appreciate popular accounts of major discoveries and important public issues in the physical sciences.

GEOS212 Intro To Oceanography
Introduces the oceans and their geological, physical, chemical and biological processes with emphasis on their history and formation and the interactions of humans with the marine environment.

GEOS214 AstroBio:Planetary Perspective
We will explore questions about the origin, evolution, and future of life on Earth and the possibility of life arising independently elsewhere in the Universe. We will examine what it means for a planet to be habitable, both in terms of basic necessities for living organisms to function and environmental limits to their ability to survive. Finally, we will review different approaches for searching for life within the Solar System and beyond using direct and remote sensing techniques.

GEOS218 Geol Disasters+Society
Geological catastrophes (earthquakes, meteorite impacts, flooding) are important processes in shaping the Earth. This course will acquaint students with the scientific principles governing these catastrophes.
Reviewing critically some aspect of dendrochronology. Various contexts. Graduate-level requirements include a research paper developing tree-ring chronologies, and evaluating tree-ring dates from paleoenvironmental reconstruction. Emphasis on dating methods, archaeological, geological, and biological dating problems and survey of dendrochronological theory and methods. Applications to data sets. At least half of the course will focus on guided data analysis based on CZO data sets. A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science. This course targets undergraduate science majors and graduates interested in learning more about integrated and interdisciplinary team science while learning about the cross-cutting research and observational strategies employed across NSF’s Critical Zone Observatory network. At least half of the course will focus on guided data analysis based on CZO data sets. Graduate-level requirements include working with more complex data sets and a 10-page research paper. In general, most seasonal-annual or multi-site data sets will qualify. Please discuss with your instructor prior to turning in a research paper proposal. Hydrologic and geologic factors controlling the occurrence and dynamics of groundwater on regional and local scales. Graduate-level requirements include a research paper on a topic related to hydrogeology but not covered in lectures. Fundamental theory of seismic wave propagation, and techniques of seismic reflection and refraction data acquisition and interpretation applied to exploration of the Earth’s lithospheric structure and natural resources. Study of methods to image the crust in 2-D and 3-D. Graduate-level requirements include development of an additional term project. Projects are more heavily weighted in determining the total grade. Survey of dendrochronological theory and methods. Applications to archaeological, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology.
GEOS578  Global Change
Analysis of the Earth system through an examination of its component parts (particularly climate and biogeochemistry) and their interactions with human activities, emphasizing information needed to understand modern and future environmental changes. Graduate-level requirements include an in-depth written exercise and additional activities as described in the syllabus.

GEOS579  Intro to Climate Dynamics
The course will cover the interactions between the different components of the climate system including the atmosphere, ocean, sea/land ice, etc., and the dominant feedbacks so that students can understand the working of the climate system and the mechanisms governing its variability and response to external perturbations. Graduate-level requirements include a final paper and presentation. The students choose the topics with the help of instructors, which maybe related to their dissertation research.

GEOS590  Remote Sens Planet Earth
A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science.

GEOS595A  Topics in Geosciences
The exchange of scholarly information and/or secondary research, usually in a small group setting. Instruction often includes lectures by several different persons. Research projects may or may not be required of course registrants.

GEOS595E  Tpcs in Dendrochronology
The exchange of scholarly information and/or secondary research, usually in a small group setting. Instruction often includes lectures by several different persons. Research projects may or may not be required of course registrants.

GEOS596F  Geophysics
The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.

GEOS596H  Geosciences
The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.

GLS250  Dimensions of Globalization
The introductory course for the IDS concentration in International Studies surveys international issues in science/technology, policy development, culture and political economy.

GWS400  Spcl Tpcs Women Studies
This course will study how the articulation of "environmental justice" and "environmental racism" emerged from African-American communities challenging efforts to dump toxic waste in their neighborhoods. And from its start, as a culmination of environmental and Civil Rights rhetoric, how environmental justice has continued to expand as an idea and movement. We will examine how the concept has been enlarged to address the ecological violence experienced by other racial and ethnic minorities in the United States, Native Americans, Latinos, and other groups. Expanding yet further, we will think about how an "environmental inequalities" perspective came to encompass gender, sex, sexuality, and class dimensions. From this historical vantage point, we will consider how environmental injustices are not exclusively a crisis in the United States. More specifically, we will ask how transnational capitalism and industrialization have helped to make inseparable social and environmental inequalities.

HIST695H  Comparative History
This course will explore how human societies have variously comprehended, used, adapted to, and valued their natural environments. In the process, we will assemble a historian's toolkit to help us better assess those relationships as well as to more clearly analyze and critique scientific and lay discourses about "nature," "ecology," and "the environment."

HNRS170A1  Human Reproduction & Environ
This class investigates the relationship between human fertility, population growth, and the environment, with an emphasis on the science behind resource demands and supply. It investigates the effects of increasing human population on ecosystems and environmental conditions at local, regional, and global scales. The course will introduce students to the scientific method, and how science can be used as a tool to objectively identify challenges and solutions to achieve a sustainable balance between humans and the environment.
HNRS202H Intro Conservation Bio This course will introduce lower-division Honors students to fundamental concepts of environmental science with an emphasis on conservation biology. The class will consist of initial orientation sessions, individual learning activities, and a field trip to the Arizona-Sonora Desert Museum.

HNRS219 Our Human Footprint This course, designed for honors students, addresses the science behind our knowledge of human impact on the planet and how we measure that impact, with an emphasis on out-of-the-classroom experience and critical thinking. We will consider multiple areas of scientific interest, including cities and transportation systems, sediment transportation, overfishing and species extinctions on land, creation and use of hazardous chemicals, waste generation, and the use of antibiotics and resources such as fossil fuels and water.

HNRS241 Global Social Entrepreneurism Social entrepreneurship is a rapidly developing field in which entrepreneurs use business methods to solve social and environmental challenges. As the traditional lines blur among nonprofits, government and businesses, it is critical that students understand the opportunities and challenges in this new landscape. This course will be structured around four central topics: the field of non-profit and social entrepreneurship; the mechanics, tensions, and realities of starting and managing a social enterprise; the emergence of "social intrapreneurism"; and the potential for scaling social and environmental solutions profitably throughout the business sector.

HWRS170A1 Earth: Our Watery Home An introduction to the science of water and its movement in and through the earth system and interactions with people and ecosystems. Special emphasis will be given to how the physical properties of water and the complexity of the earth system interact with human societies and ecosystems to create the challenges and opportunities of water resources. The fundamental importance of physics, chemistry, and mathematics to water science will be stressed.

HWRS201 Water Science+Environment Water plays a crucial role in the physical, chemical, and biological processes that regulate the Earth system. The relations of physical hydrology are derived from the fundamental laws of physics and chemistry. The water cycle forms the framework for the study of hydrological science. Honors section available.

HWRS203 Az Water Issues Study of the use and misuse of water throughout Arizona and the fundamental tools used to study water supply, quality, and conservation. Introduction to basic hydrologic principles to help students deal with issues they will encounter later as public citizens in their own communities.

HWRS249A Principals of Hydrology Introduction to the hydrologic cycle and review of main processes, such as precipitation, evaporation and transpiration, runoff, infiltration and ground water. Some concepts and tools for water resources management are discussed. Laboratory techniques complement lecture topics.

HWRS250 Principles Of Hydrology Introduction to the hydrologic cycle and review of main processes, such as precipitation, evaporation and transpiration, runoff, infiltration and ground water. Some concepts and tools for water resources management are discussed. Laboratory techniques complement lecture topics.

HWRS417A Fndmts Of Water Quality Introduction to chemical processes affecting the behavior of major and minor chemical species in the aquatic environment. Physical, equilibrium, inorganic/organic, and analytical principles as applied to natural waters.

HWRS422 Critical Zone Science & Mgmt This course targets undergraduate science majors and graduates interested in learning more about integrated and interdisciplinary team science while learning about the cross-cutting research and observational strategies employed across NSF's Critical Zone Observatory network. At least half of the course will focus on guided data analysis based on CZO data sets.


HWRS431 Hydrogeology Hydrologic and geologic factors controlling the occurrence and dynamics of groundwater on regional and local scales.
Risk Asmnt for Enviroment Sys

A multidisciplinary course based on evaluating risk as the loss expected from environmental catastrophes or from the failure of systems designed for environmental protection. Examples will be drawn from hydrology, atmospheric science, and geology. The emphasis is on adapting the tools of probabilistic risk assessment to environmental analyses. Graduate-level requirements include a written review of a seminal paper and its presentation in class.

Statistical Hydrology

Application of statistics and probability to uncertainty in the description, measurement, and analysis of hydrologic variables and processes, including extreme events, error models, simulation, sampling.

Dryland Ecohydro&Veg Dynamics

Overview of ecological and hydrological interrelationships, including ecologically meaningful water budgets, and associated vegetation dynamics for water-limited, dryland ecosystems.

Watershed Hydrology

Watershed hydrology looks at how water movement, storage and transformation on the Earth’s surface is influenced by landscape characteristics, including human modifications of those characteristics, and weather. As such, watershed hydrology will focus on surface water. However, this course offers a brief introduction to groundwater as it pertains to watershed hydrology.

Remote Sens Planet Earth

A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science.

Fndmntls Of Water Quality

Introduction to chemical processes affecting the behavior of major and minor chemical species in the aquatic environment. Physical, equilibrium, inorganic/organic, and analytical principles as applied to natural waters. Graduate-requirements include writing a review paper and oral presentation, differential problem sets for homework and exams.

Critical Zone Science & Mgmt

This course targets undergraduate science majors and graduates interested in learning more about integrated and interdisciplinary team science while learning about the cross-cutting research and observational strategies employed across NSF’s Critical Zone Observatory network. At least half of the course will focus on guided data analysis based on CZO data sets. Graduate-level requirements include working with more complex data sets and a 10-page research paper. In general, most seasonal-annual or multi-site data sets will qualify. Please discuss with your instructor prior to turning in a research paper proposal.

Computer Aplcn:Hydraulic

Computer modeling of surface water hydrology, flood plain hydraulics and water distribution systems. Theoretical basis. Application and design studies. Graduate-level requirements include a research paper or project.

Fund:Systms Approach Mod

Introduction to the language, methods, and tools of systems analysis and computer-based modeling, and their application to the science, risk assessment, management, and planning aspects of hydrology and water resources.

Hydrogeology

Hydrologic and geologic factors controlling the occurrence and dynamics of groundwater on regional and local scales. Graduate-level requirements include different grading criteria and exam components plus completing a group research project in coordination with the instructor.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>HWR560A</td>
<td>Watershed Hydrology</td>
<td>Watershed hydrology looks at how water movement, storage and transformation on the Earth's surface is influenced by landscape characteristics, including human modifications of those characteristics, and weather. As such, watershed hydrology will focus on surface water. However, this course offers a brief introduction to groundwater as it pertains to watershed hydrology. Graduate-level requirement includes required completion of a graduate &quot;environmental inquiry&quot; through volunteer work. Graduate students will be required to blog about these experiences.</td>
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<tr>
<td>HWR573</td>
<td>Hydrology for Water Resources</td>
<td>This course will develop the students' understanding of the hydrologic cycle, its constituent parts on the hydrologic cycle. It will then expose students to various ways in which human management influences the hydrologic cycle and ways in which the hydrologic cycle controls water resources management.</td>
</tr>
<tr>
<td>HWR578</td>
<td>Global Change</td>
<td>Analysis of the Earth system through an examination of its component parts (particularly climate and biogeochemistry) and their interactions with human activities, emphasizing information needed to understand modern and future environmental changes. Graduate-level requirements include an in-depth written exercise and additional activities as described in the syllabus.</td>
</tr>
<tr>
<td>HWR590</td>
<td>Remote Sens Planet Earth</td>
<td>A multidisciplinary course delineating the physical basis of electromagnetic remote sensing, the concepts of information extraction, and applications pertinent to earth systems science.</td>
</tr>
<tr>
<td>HWR595A</td>
<td>Adv Catchment Hydrology</td>
<td>Concepts and methodology required to upscale near-surface hydrologic processes to catchment scales with development of watershed models to quantify hydrologic response in different climates. Special attention given to how landscape geomorphologic structure affects hydrologic behavior.</td>
</tr>
<tr>
<td>IMB521</td>
<td>Scientific Grantsmanship</td>
<td>An interactive graduate-level course focused on written scientific communication and research integrity/ethics. The writing portion of the course is developed with a particular emphasis on NIH-style grant writing to develop the necessary skills to develop and write fellowship and grant applications. Students will work together with faculty and in peer groups to develop scientific hypotheses, aims, and research plans. The students will develop an NIH-style research proposal through the course of the semester. The student will develop skills necessary to for successful scientific writing.</td>
</tr>
<tr>
<td>LAR420</td>
<td>Plant Materials</td>
<td>This course focuses on the examination and evaluation of plants effectively used in landscapes of the Southwest. Emphasis is placed on strategies useful for plant identification and appropriate plant selection for a variety of landscape uses. Field studies will be the primary mode of instruction whereas classroom lectures provide support material for the field work.</td>
</tr>
<tr>
<td>LAR520</td>
<td>Plant Materials</td>
<td>Laboratories focus on identification and description of native and select exotic landscape plants frequently used in landscape design and revegetation in the Southwest. Lectures emphasize terminology, plant care and maintenance, and influence of site conditions and requirements on plant selection.</td>
</tr>
<tr>
<td>LAR529</td>
<td>Intro to the Built Environment</td>
<td>An introduction to major cultural and theoretical issues that have shaped the built environment, including aspects of planning, landscape architecture, and architecture, through a series of in-depth, interdisciplinary, thematic explorations.</td>
</tr>
<tr>
<td>LAS150B1</td>
<td>Mod Lat Am: Social Sci Perspect</td>
<td>An interdisciplinary introduction to the people, place and cultures of Latin America and to the political, economic and social institutions and conditions of the region. Social Interactions and Relationships - The course examines how and why environmental quality, economic development, living conditions, democracy, migration, trade, religion and US policy vary across different countries and social sectors.</td>
</tr>
</tbody>
</table>
LAS195A  Us-Mex Border: Sep+Integ

An introduction to the complexities of the local border reality and prepares students to better appreciate the challenges and opportunities facing the region from a variety of perspectives. Though not exclusive, areas of concern include business, trade, health care, education, environment, tourism, migration and security. An interdisciplinary approach to the transnational dynamics of the borderlands provides wide appeal across programs and majors. Guest speakers representing the different border region constituencies will complement the class lectures and discussions. Participation in this colloquium prepares the student for an optional field trip course (LAS 395a) to the border region and/or into the neighboring state of Sonora taking place over several weekends during the fall semester. Students will be evaluated on the basis of attendance and participation, a short reflection paper (3 - 4 pages), and a final oral presentation. Students taking the course for Honors credit will be assigned special readings and/or attend special related lectures to report on during class sessions and receive honors grading.

LAS348  Drug Wars/Oil Fortunes Lat Am

With a focus on Latin America, this course examines the historical, comparative, and current dynamics of two global commodities: illicit drugs and oil. These commodities - which depend on a U.S. consumer base - generate unfathomable wealth and unrelenting violence at local, national, and international levels. We follow them from extraction and production through consumption, examining socioeconomic and environmental impacts, their relationship to state corruption, and possible strategies for responding to the problems they create.

LAS497F  Comm/School Garden Workshop

This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

LAS595N  Environ+Conflict Lat Am

This course examines how environmental, social, cultural, and political factors in Latin America intersect with processes of globalization to impact conflict over scarce natural resources and socioeconomic uncertainty.

LAS597F  Comm/School Garden Workshop

This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.
LAW624B  AJELP  The Arizona Journal for Environmental Law and Policy (AJELP) is a student-run journal supervised by the faculty at the College of Law. Students will perform tasks such as article selection, editing, and publication administration. For example, AJELP's Senior Managing Editor must coordinate the Journal's citation checking and general production, much like the Senior Managing Editors of the University's other student-run publications. Because AJELP publishes exclusively online, the Managing Board includes Online Editors who must maintain, design, and moderate its website. The Online Editors must also select, edit, and publishing online pieces such as article commentary and weblog posts. Online Editors perform work commensurate with that of Articles Editors from the College of Law's other student-run publications. The Managing Board also includes an Executive Editor, who will assist in editing the publication and provide the crucial administrative support necessary for a start-up student publication. The Executive Editor will also work with ALR and AJICL in creating and facilitating the write-on competition for first year students. AJELP's editorial staff will verify citations, format per Bluebook rules, edit submissions, and select articles for publication throughout the year. Published articles with a legal focus will not be subject to peer review, so citation verification and Bluebook formating will be as critical and as time intensive as on the University's other student-run publications. In addition to assisting the other publications in grading the annual write-on competition, AJELP also requires each Editorial Staff member to submit a five hundred to one thousand word legal analysis on a contemporary environmental issue.

LAW625B  Colorado River in American Hst  The focus of the course is the Colorado River. Using the work of the New West historians as a framework, we will examine the role of the Colorado River in American History. After examining the geology of the Grand Canyon and the use made of the River and its resources by Native peoples, we will examine the exploration of the Colorado River and its canyons by John Wesley Powell and other early European explorers. The main theme of the course will be the important role that the water of the Colorado River has played in the Southwest. The battle among competing interests to harness the waters of the River, and the fight over the legal rights to use the water, has consumed essentially the entire twentieth century. By critically examining these fights, aided by readings from other disciplines, including environmental history, literature, economics, and ecology, the history of the Colorado River will suggest lessons about current public policy issues as well as insights into American attitudes about nature and natural resources, particularly water.

LAW696I  Intnl Environmntl Law  The development and exchange of scholarly information, usually in a small group setting. The scope of work shall consist of research by course registrants, with the exchange of the results of such research through discussion, reports, and/or papers.

MCB340  Intro to Biotechnology  Survey of both the basic concepts and techniques used in the analysis and improvement of biological organisms by genetic engineering and cell culture as well as examples of biotechnology improvements that have been made in various organisms. The course covers topics ranging from bioremediation to Cancer Stem Cells.

MCB440  Mechanisms in Plant Dev  Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems.

MCB448A  Plant Bioc/Metabolic Eng  Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-Chem and a biochemistry course that covers general metabolism prior to taking this course.

MCB540  Mechanisms: Plant Development  Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems. Graduate-level requirements include seven journal club discussions and presentations for graduate students and honors undergraduate students.
MCB548A  Plant Bioc/Metabolic Eng  Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course. Graduate-level requirements include 2 or 3 short individual oral presentations and a term paper.

MIC305  Intro Plant Pathology  Detailed study of representative plant diseases, with emphasis on basic concepts of diagnosis, cause, epidemiology, and control.

MIC310  Living In Symbiosis  This course will provide an overview of the diversity of associations that exist between microbes and eukaryotic hosts. The course will span from highly integrated obligatory symbioses to loose associations. Emphasis will be placed on symbiotic associations with relevance to human medicine, veterinary sciences, and agriculture.

MIC340  Intro to Biotechnology  Survey of both the basic concepts and techniques used in the analysis and improvement of biological organisms by genetic engineering and cell culture as well as examples of biotechnology improvements that have been made in various organisms. The course covers topics ranging from bioremediation to Cancer Stem Cells.

MIC425  Envir Microbiology  Current concepts in water quality, aerobiology and microbial biogeochemistry.

MNE205  Intro to Mining Engineering  Introductory course covering the fundamental processes for sustainable resource development. Students will learn the science, engineering, and policies to locate an ore deposit, plan surface and underground mines, operate mines and processing facilities, reclaim mine sites, and work with communities. Students will develop mine plans based on data and operating parameters.

MNE422  Engr Sustainable Dev  This course is for students who wish to learn and engage in modern sustainable development practices with respect to engineering projects that have three areas of impact: economic, environmental and societal. The course will provide background for an understanding of the complexities and inter-relations of sustainable development issues. The focus will be on the minerals development industry, and the impacts in industrialized and developing nations, communities and the environment.

MNE484  Fund Industr+Envir Hlth  Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards.

MNE522  Engr Sustainable Dev  This course is for students who wish to learn and engage in modern sustainable development practices with respect to engineering projects that have three areas of impact: economic, environmental and societal. The course will provide background for an understanding of the complexities and inter-relations of sustainable development issues. The focus will be on the minerals development industry, and the impacts in industrialized and developing nations, communities and the environment. Graduate-level requirements include project management duties, where graduate students are expected to manage groups of undergraduates in the design of the final term project. Additional graduate projects and assignments will have requirements for type and quantity of work.
NSC497F Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum.

NSC597F Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

OPTI526 Optic Dsgn:Multiscale Photonic
This course provides students opportunities to understand basic theories and procedures to design and analyze multiscale and nanophotonic optical system such as nanoaperture scanning microscope, solar concentrator optical system with textured solar cells, holographic data storage employing volume grating as well as complex lens system.

OPTI527 Holography+Diff Optics
This course describes the nature of holographic and lithographically formed diffraction gratings and the tools necessary for their design and analysis. Course topics include a description of the interference and Fourier relations that determine the amplitude of diffracted fields, analysis of volume gratings, properties of holographic recording materials, computer generated holograms, binary gratings, analysis of applications of holography including data storage, imaging systems, photovoltaic energy systems, polarization control elements, and associative memories. We will also have a number of lab demonstrations fabricating holograms in a new type of photopolymer.

PA323 Environmental Ethics
Do we have an obligation to recycle? What can and what should we do about the quality of our air and water? In general, what are the proper environmental responsibilities of government, business, community organizations, and individual citizens?

PA553 Quantitative Policy Analysis I
First semester of a year-long Quantitative Policy Analysis sequence. It is a fundamental course in the Master of Public Policy degree.

PCOL484 Fund Industr+Envir Hlth
Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards.

PCOL502 Envrmtl Monitoring Meth
Introduction to sampling techniques and analytical methods to measure environmental contamination in the air, water, soils and food. Emphasis on instrument selection and quality control, including documentation, calibration, and sample management.

PCOL584 Fund Industr+Envir Hlth
Introduction to the principles of occupational and environmental health, with emphasis on industrial hygiene aspects of recognition, evaluation, and control of environmental and industrial health hazards. Graduate-level requirements include a comprehensive paper detailing hazards associated with a particular health hazard.
PCOL819A  Health Lit:Srvc Learning  Health Communication is a three-unit course with lab - for pharmacy students and students with an interest in health communication. In class, students learn the curricula they will use in their service learning assignments and study communication styles, health communication, health literacy, health materials evaluation, and the environmental health context for health communication. They complete written assignments; make presentations concerning health literacy, their outreach experiences, and environmental health. Students are assessed on their presentations, weekly journals, evaluation from their site supervisor, class participation, and a final paper.

PHIL322  Business Ethics  Selected ethical issues in business, including corporate responsibility, preferential hiring and reverse discrimination, advertising practices, environmental responsibility.

PHIL323  Environmental Ethics  Do we have an obligation to recycle? What can and what should we do about the quality of our air and water? In general, what are the proper environmental responsibilities of government, business, community organizations, and individual citizens?

PLG256  Sustainable Cities+Socs  Urbanization and cities within the sustainability framework. Global urbanization, social justice, environmental equity, growth management, "the new urbanism." International cases. Web based projects.

PLG379  Urban Growth+Development  Location patterns in urban areas and processes of growth; historical development of U.S. cities, rent theory, housing markets, commercial and industrial location, the role of transportation, urban finance, New Urbanist planning and sustainable development concepts.

PLG468  Urban Transport Planning  Transportation planning in relation to urban development; techniques and procedures for developing long-range regional plans. Usually offered every third semester beginning Fall 2002.

PLG472  Enviro Land Use Planning  This course focuses on the complex linkages between human and natural systems. Environmental planning utilizes methodologies which are systematic, iterative, and transparent and relies on integrating a wide spectrum of contemporary environmental issues in order to achieve more sustainable land use outcomes. As an interdisciplinary course, it draws from the fields of planning, geography, design, land use law, public policy, economics, natural science, and engineering among others. This course aims to equip students with a broad knowledgebase which focuses on landscape components and processes. Further, students will develop the necessary land use analysis and management skills in order to help guide land use decision making, engage stakeholders, and minimize/mitigate conflict between natural and built systems in an effort to produce more sustainable land use patterns and plans.

PLG497S  Sustain Develop & New Urbanism  Examines contemporary competition between environment, resources (water, energy), social equity, and economic viability in the community development and revitalization arena. Public policy, planning initiatives, design strategies and technical solutions that bridge the conflicting agendas are analyzed. Field investigation of contemporary cases. Appropriate for students specializing in planning, architecture and landscape architecture.

PLG568  Urban Transport Planning  Transportation planning in relation to urban development; techniques and procedures for developing long-range regional plans. Usually offered every third semester beginning Fall 2002.

PLG572  Enviro Land Use Planning  This course focuses on the complex linkages between human and natural systems. Environmental planning utilizes methodologies which are systematic, iterative, and transparent and relies on integrating a wide spectrum of contemporary environmental issues in order to achieve more sustainable land use outcomes. As an interdisciplinary course, it draws from the fields of planning, geography, design, land use law, public policy, economics, natural science, and engineering among others. This course aims to equip students with a broad knowledgebase which focuses on landscape components and processes. Further, students will develop the necessary land use analysis and management skills in order to help guide land use decision making, engage stakeholders, and minimize/mitigate conflict between natural and built systems in an effort to produce more sustainable land use patterns and plans. Graduate-level requirements include five additional hands-on exercises designed to help graduate students develop skills suitable for professional practice in the field and writing a two page synopsis and critical review of a coastal zone management program.
Public participation is fundamental to how we plan, manage, and develop our urban areas. Various scales of government require public participation and engagement in policy development and planning. This course explores different public participation methods and tools, what to expect from working with the public and how to handle disputes that may arise. Additionally, this course will develop an understanding of the principles, strategies, and tactics of effective negotiation and professional relationship management. This course is designed for graduate students with no prior background or experience in the fields of public participation, negotiation, or dispute resolution. Lectures, case studies, and simulations are used to introduce students to the “art” and “science” of working with the public and conflict management. The class also provides an intensive opportunity to build individual negotiating skills. Occasional guest lectures by well-known practitioners provide an opportunity for students to test some of the theoretical ideas presented in class against the issues that arise in practice.

Examines contemporary competition between environment, resources (water, energy), social equity, and economic viability in the community development and revitalization arena. Public policy, planning initiatives, design strategies and technical solutions that bridge the conflicting agendas are analyzed. Field investigation of contemporary cases. Appropriate for students specializing in planning, architecture and landscape architecture.

Detailed study of representative plant diseases, with emphasis on basic concepts of diagnosis, cause, epidemiology, and control.

Microbial diversity is a course offered to students in Microbiology, and to other majors with an interest in the remarkable genetic, species-level, phylogenetic, functional, and ecological diversity of prokaryotic and eukaryotic microorganisms.

An exploration of the diversity of fungi and fungus like organisms covering general biology and roles as pathogens (of humans and plants), saprobes and symbionts. Fungi as models for eukaryotic molecular research and their uses in industry will be covered.

An exploration of the diversity of fungi and fungus like organisms covering general biology and roles as pathogens (of humans and plants), saprobes and symbionts. Fungi as models for eukaryotic molecular research and their uses in industry will be covered. Graduate-level requirements include a term paper 10 pages in length to allow a more in depth exploration of a topic in fungal biology. Also required is a 30 minute oral presentation on a topic of choice for 100 points of grade.

Departmental seminar providing a forum for graduate students to present research objectives and progress. Student presentations will be evaluated by course instructors and selected faculty. Students will also have the opportunity to participate in the seminar evaluation process.

Biological Sciences - Plants and Our World will cover the principles of plant growth, development, and reproduction from the cellular to the whole organism levels, explore how plants are affected by their environment, and their ecology and evolution. The emphasis of the course is on what makes plants uniquely interesting and different from other organisms, and their importance to life and society.

The course is designed to help you develop a deeper understanding of careers in the plant sciences so that you can better appreciate their importance in our lives, and see examples of professions available to those with a plant sciences background. Plants are not only an important part of our environment (farms, landscapes and natural areas), but they are also absolutely essential for our survival and the survival of all life on the planet. Among other things, they provide us with a wide variety of foods, medicines, fibers for clothing, materials to build our homes, as well as vistas for our aesthetic pleasure. They are the ultimate source of most of the fuels that we use to heat/cool our homes, cook our foods, light our streets, and run our engines.
PLS217 Intro Hydroponics & Cntrl Envi
Hydroponics and controlled environment agriculture: an historical perspective; basic plant physiology and anatomy; general cultural practices; plant protection (insects and diseases); hydroponic systems; pollination, fertilization and bee management; plant nutrition and disorders; irrigation systems and nutrients; transplant production; greenhouse site selection, structures and control systems; fruit harvest; marketing and economics of a hydroponic business.

PLS240 Plant Biology
This course deals with plant form and function from an evolutionary point of view and is intended for majors in all fields of biology. Emphasis is placed on understanding basic processes of metabolism, evolution, reproduction, growth, development, and physiology of nonvascular and vascular plants. These processes are considered within the context of the environments plants inhabit and human activities that affect or depend upon plants.

PLS359 Plant Cell Structure & Function
Whether you will work with plants as a physiologist, pathologist, ecologist, agronomist, horticulturist, or molecular biologist, you will need to know how a plant is constructed, how it grows, and how it functions. Depending on the need and your interests, you may work at the subcellular, cellular, tissue, organ, or whole plant level. As a result, it is important to have a comprehensive understanding of plant cell structure and function. In this course, we will start with the molecular and subcellular organization of a single plant cell. Subsequently, we will investigate tissue levels of organization and function. Emphasis will be placed on not only teaching the structural aspects but also discussing the functions of a plant cell, tissue, and organ. Organ and whole plant growth and physiology will be covered in PLS 360 (Plant Growth and Physiology), a course that will be offered in the spring semester.

PLS440 Mechanisms in Plant Dev
Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems.

PLS448A Plant Bioc/Metabolic Eng
Covering topics in plant metabolic engineering: photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course.

PLS483 Controlled Environ Systm
An introduction to the technical aspects of greenhouse design, environmental control, hydroponic crop production, plant nutrient delivery systems, intensive field production systems, and post-harvest handling and storage of crops.

PLS497F Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum.

PLS540 Mechanisms: Plant Development
Focuses on the molecular genetic mechanisms of plant development using primarily the current model systems. Graduate-level requirements include seven journal club discussions and presentations for graduate students and honors undergraduate students.
PLS548A  Plant Bioc/Metabolic Eng  Covering topics in plant metabolic engineering; photosynthesis; carbohydrate, nitrogen and lipid metabolism; specialized metabolism. This course covers biochemical processes specific to plants and allows students to gain an understanding and appreciation of how (bio)chemical components are synthesized and utilized by plants during growth and development and in their interactions with their environment, as well as how these processes can be manipulated. A background in plant biology, general biochemistry or chemistry is expected. Note that concurrent registration in any of these courses will NOT meet this requirement. Students must have completed both semesters of O-chem and a biochemistry course that covers general metabolism prior to taking this course. Graduate-level requirements include 2 or 3 short individual oral presentations and a term paper.

PLS583  Controlled Environ Systm  An introduction to the technical aspects of greenhouse design, environmental control, hydroponic crop production, plant nutrient delivery systems, intensive field production systems, and post-harvest handling and storage of crops. Graduate-level requirements include submission of a comprehensive report related to a specific greenhouse design project.

PLS97F  Comm/School Garden Workshop  This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one field trip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

POL348  Drug Wars/Oil Fortunes Lat Am  With a focus on Latin America, this course examines the historical, comparative, and current dynamics of two global commodities: illicit drugs and oil. These commodities ¿ which depend on a U.S. consumer base ¿ generate unfathomable wealth and unrelenting violence at local, national, and international levels. We follow them from extraction and production through consumption, examining socioeconomic and environmental impacts, their relationship to state corruption, and possible strategies for responding to the problems they create.

POL424A  Political Ecology  This course introduces a variety of environmental thought linking the political sphere and the biosphere. It examines ecological economics, environmental history and ethics, theoretical ecology, ecofeminism, political ecology in anthropology and intellectual property law.

PTYS170A1  Plnt Earth:Evl Hab World  This course develops a planetary perspective on the evolutionary processes that shaped Earth throughout history. We will examine why Earth is habitable, that is, why any kind of life can live on it, we will discuss the unique influences that biological processes and atmosphere/ocean systems have on each other, and we will review current notions of climate change, including evidence for the influence of human activities on it. This interdisciplinary treatment of Earth and its sister planets will encourage students to think about how science and engineering must be applied to today's challenges if humankind is to have a promising future on (and off) this planet.

RAM431A  Tradition Ecological Knowledge  An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.
| RAM441A | Nat Rsrg Mgmt Native Com | This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change. |
| RAM456A | Rangeland Invent+Monitor | Techniques of mapping and measuring attributes of vegetation and soils for inventory and monitoring of range lands. Interpretation of data with respect to range condition and trend, watershed protection, value for livestock and wildlife habitat. |
| RAM531A | Tradition Ecological Knowledge | An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic. |
| RAM541A | Nat Rsrg Mgmt Native Com | This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change. Graduate-level requirements include increased length of writing assignments. |
| RAM556A | Rangeland Invent+Monitor | Techniques of mapping and measuring attributes of vegetation and soils for inventory and monitoring of range lands. Interpretation of data with respect to range condition and trend, watershed protection, value for livestock and wildlife habitat. Graduate-level requirements include completion of additional readings and an independent research project and report. |
| RAM696A | Rangeland Management | The development and exchange of scholarly information, in a small group setting, on selected topics in Rangeland science and management. Course registrants exchange results of research through discussions, reports, and/or papers. |
| RCSC150B2 | Money, Consumers & the Family | This course describes the prominent characteristics of consumption behavior, societal change that has influenced consumer-driven societies and pressures for change in the future. The course will examine the important economic variables that, on the one hand, have led to a rapidly growing worldwide consumer demand for goods and services and, on the other hand, have resulted in increased debt, overspending and an inability to achieve long term personal financial goals. An objective analysis of both personal and global consumption habits will provide the transition into sustainable strategies to increase personal financial solvency. The course will not provide you with the answers to achieving your personal financial goals, but rather will examine our consumer society and expose you to the major reasons why people spend and save. The aim of the course is to provide you with sufficient information to make judgments for yourself about your consumption patterns and long-term financial health. |
| RED597S | Sustain Develop & New Urbanism | Examines contemporary competition between environment, resources (water, energy), social equity, and economic viability in the community development and revitalization arena. Public policy, planning initiatives, design strategies and technical solutions that bridge the conflicting agendas are analyzed. Field investigation of contemporary cases. Appropriate for students specializing in planning, architecture and landscape architecture. |
Much of modern society’s experience of managing resources and protecting people and infrastructure has occurred during a period of relatively stable climate. In the most recent decades in the Southwest, we have observed a cascade of impacts associated with temperature increases, including changes in snow hydrology, in phenology, and in the severity of drought impacts. Projected future climate changes and impacts may lie outside the range of climate variation that we have observed and may have more serious consequences for society and the environment. Anticipating projected changes will allow society to identify response options across a range of vulnerabilities and manage the risks associated with projected climate changes. In the best possible cases, these actions or adaptations, may provide economic and other benefits to society. In this 3 credit course, we will examine actions to reduce vulnerabilities or increase resilience to the potential impacts of climate change. While the general focus will be on impacts and responses in the arid Southwest (water, fire, species, ecosystems), we will also investigate the philosophies and frameworks for advancing action and incorporation of adaptation planning at the regional, national and international scale.
RNR503  Appl Geog Info Sys
General survey of principles of geographic information systems (GIS); applications of GIS to issues such as land assessment and evaluation of wildlife habitat; problem-solving with GIS. Graduate-level requirements include completion of a project on the use of GIS in their discipline or an original GIS analysis (100 points) in coordination with the instructor.

RNR517  Geog Inf Sys/Nat+Soc Sci
Introduction to the application of GIS and related technologies for both the natural and social sciences. Conceptual issues in GIS database design and development, analysis, and display. Graduate-level requirements include a thorough bibliographic review and a scholarly paper on a current application of geographic information systems in the student’s major field.

RNR531A  Tradition Ecological Knowledge
An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic.

RNR540  Climate Change Adaptation
Much of modern society’s experience of managing resources and protecting people and infrastructure has occurred during a period of relatively stable climate. In the most recent decades in the Southwest, we have observed a cascade of impacts associated with temperature increases, including changes in snow hydrology, in phenology, and in the severity of drought impacts. Projected future climate changes and impacts may lie outside the range of climate variation that we have observed and may have more serious consequences for society and the environment. Anticipating projected changes will allow society to identify response options across a range of vulnerabilities and manage the risks associated with projected climate changes. In the best possible cases, these actions or adaptations, may provide economic and other benefits to society. In this 3 credit course, we will examine actions to reduce vulnerabilities or increase resilience to the potential impacts of climate change. While the general focus will be on impacts and responses in the arid Southwest (water, fire, species, ecosystems), we will also investigate the philosophies and frameworks for advancing action and incorporation of adaptation planning at the regional, national and international scale. Graduate-level requirements include completing a more in-depth project or research paper based on the course internship. The writing assignment will be identified by agency partners and approved by the instructors, and will address a subject of direct relevance to the organization’s program.

RNR541A  Nat Rsrc Mgmt Native Com
This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water; fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change. Graduate-level requirements include increased length of writing assignments.

RNR552  Dryland Ecohydro&Veg Dynamics
Overview of ecological and hydrological interrelationships, including ecologically meaningful water budgets, and associated vegetation dynamics for water-limited, dryland ecosystems. Graduate-level requirements include different grading criteria and exam components plus completing a group research project in coordination with the instructor.
This course focuses on the complex linkages between human and natural systems. Environmental planning utilizes methodologies which are systematic, iterative, and transparent and relies on integrating a wide spectrum of contemporary environmental issues in order to achieve more sustainable land use outcomes. As an interdisciplinary course, it draws from the fields of planning, geography, design, land use law, public policy, economics, natural science, and engineering among others. This course aims to equip students with a broad knowledgebase which focuses on landscape components and processes. Further, students will develop the necessary land use analysis and management skills in order to help guide land use decision making, engage stakeholders, and minimize/mitigate conflict between natural and built systems in an effort to produce more sustainable land use patterns and plans. Graduate-level requirements include five additional hands-on exercises designed to help graduate students develop skills suitable for professional practice in the field and writing a two page synopsis and critical review of a coastal zone management program.

Analysis of the Earth system through an examination of its component parts (particularly climate and biogeochemistry) and their interactions with human activities, emphasizing information needed to understand modern and future environmental changes. Graduate-level requirements include an in-depth written exercise and additional activities as described in the syllabus.

Remote Sensing for the Study of Planet Earth introduces basic and applied remote sensing science as a means to explore the diversity of our planetary environments (biosphere, atmosphere, lithosphere and hydrosphere) within the radiometric, spectral, spatial, angular and temporal domains of remote sensing systems. This survey course strikes a balance between theory, applications and hands-on labs and assignments. We explore how you can download, process, analyze and interpret multi-sensor data and integrate online remotely sensed data sources/products into your research of interest.

The third U. S. National Climate Assessment was released in May, 2014 and provides a comprehensive assessment of the many types of environmental, social and physical impacts occurring and projected to occur in the U.S. We will work our way through the final version of the assessment, discuss a diverse array of approaches to vulnerability and impact assessment, and hear from several authors involved in writing the assessment. This seminar will provide you with strategic, thorough and extremely up-to-date in-depth knowledge on climate change impacts within regions and sectors of the U.S., and will prepare you to tackle environmental problem solving in the context of climate change, whatever your specialty. Grading basis: Alternative Grading: S,P,C,D,E

The development and exchange of scholarly information, in a small group setting, on selected topics in Natural Resources science and management. Course registrants exchange results of research through discussions, reports, and/or papers.

This course is designed to introduce students to the various ways that water science, societal forces, and public policy intersect, and to familiarize students with the various units on campus addressing complex interdisciplinary water management questions.

This first-year colloquium will prepare students with insight into sustainable concepts and practices. Students will learn about sustainability and its impacts on the built environment from a national and global perspective.

This first-year colloquium will prepare Sustainable Built Environments and exploratory students with insight into careers in sustainability. Students will learn about the career paths offered by the degree program and practice professional skills required to obtain internships and jobs.

The focus of this course is on sustainable design and planning and is a framework for how we plan, build, and live in our built environments in a way that better balances environmental, social, and economic demands.
STCH497F  Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum.

STCH597F  Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

TLS200  Sustainability+Education
This course explores the complex web of relationships between environmental, economic, and social systems. It studies the causes, consequences, and alternatives related to the exploitation of natural resources, the distribution of wealth, the consumption of goods and services in society, and its relationship to formal and non-formal education.

TLS497F  Comm/School Garden Workshop
This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum.
TTE597F Comm/School Garden Workshop

This workshop-based course is designed to enable UA undergraduates and graduates students to work in Tucson-area schools helping students and teachers to undertake the design, construction, planting, harvesting and preparation of foods from a local school garden. The workshop also involves preparing or assembling curriculum materials to enable teachers and students to teach and learn about food production, food histories and geographies, and food politics. The course includes an intensive workshop sponsored by the Tucson Community Food Bank. In addition to attending that workshop, students are also expected to attend at least one fieldtrip among the two that are organized during the semester as well as attend monthly meetings of the group on the UA campus. Most of the workshop, however, revolves around consistent and engaged involvement with a Tucson school and its teachers and students supporting the development and maintenance of school garden and attendant curriculum. Graduate-level requirements include a 8-10 page research paper that explores some aspect of wider impacts of community/school gardens. Expectations about this final paper will be provided during the first week of the course.

WFSC430 Conservation Genetics

Basic methods and theories of genetic/genomic analyses together with the application of these analyses to promote conservation, proper management, and long term survival of free-ranging species, including the exploration of current conservation genetic/genomic literature.

WFSC431A Tradition Ecological Knowledge

An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.

WFSC441A Nat Rsrc Mgmt Native Com

This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water, fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change.

WFSC444 Wildlife Management

Management of wildlife as a resource; characteristics of wildlife species; principles of population dynamics in wildlife populations; techniques used in studying wildlife.

WFSC449 Diseases of Wildlife

Important diseases of wildlife. Immunity, disease mechanisms, infectious agents, diagnostic procedures, and post-mortem techniques as well as a survey of selected but generally well-recognized diseases of wildlife.

WFSC474 Aquatic Plants+Enviromnt

The role of riparian areas, estuaries, and constructed wetlands in the environment. Emphasis on plants as wildlife habitat for nutrient cycling and bioremediation.

WFSC530 Conservation Genetics

Basic methods and theories of genetic/genomic analyses together with the application of these analyses to promote conservation, proper management, and long term survival of free-ranging species, including the exploration of current conservation genetic/genomic literature.

WFSC531A Tradition Ecological Knowledge

An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic.

WFSC541A Nat Rsrc Mgmt Native Com

This course is a survey of basic issues and concepts in natural resource management and the environment in Native communities using integrated case studies that survey all the major varieties of environmental issues in Indian Country in the 21st century. A central theme will be developing tribally-specific solutions to rebuilding the resiliency of degraded ecosystems. We will consider particular case studies such as: tribal sovereignty, land tenure, reserved rights and Native claims; Native knowledge systems and Western science; co-management and restoration; water, fish and wildlife; agriculture and rangeland management; energy, mining and nuclear waste; and global climate change.
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<thead>
<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>WFSC549</td>
<td>Diseases of Wildlife</td>
<td>Important diseases of wildlife. Immunity, disease mechanisms, infectious agents, diagnostic procedures, and post-mortem techniques as well as a survey of selected but generally well-recognized diseases of wildlife. Graduate-level requirements include a class presentation for which students will review the literature and prepare and present a lecture on a wildlife disease topic to the class.</td>
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<tr>
<td>WFSC574</td>
<td>Aquatic Plants+Enviromnt</td>
<td>The role of riparian areas, estuaries, and constructed wetlands in the environment. Emphasis on plants as wildlife habitat for nutrient cycling and bioremediation. Graduate-level requirements include an additional research project and class presentation.</td>
</tr>
<tr>
<td>WFSC585</td>
<td>Mammalogy</td>
<td>Systematics, ecology, and evolution of mammals. Graduate-level requirements include an exercise in mammalian taxonomy and a higher level of performance.</td>
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<tr>
<td>WFSC696A</td>
<td>Fish + Wildlife Ecology</td>
<td>The development and exchange of scholarly information, in a small group setting, on selected topics in Wildlife and Fisheries science and management. Course registrants exchange results of research through discussions, reports, and/or papers.</td>
</tr>
<tr>
<td>WSM330</td>
<td>Intro to Remote Sensing</td>
<td>Introduction to remote sensing principles, techniques, and applications, designed principally for those with no background in the field.</td>
</tr>
<tr>
<td>WSM431A</td>
<td>Tradition Ecological Knowledge</td>
<td>An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences.</td>
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<td>WSM441A</td>
<td>Nat Rsrc Mgmt Native Com</td>
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<tr>
<td>WSM452</td>
<td>Dryland Ecohydro&amp;Veg Dynamics</td>
<td>Overview of ecological and hydrological interrelationships, including ecologically meaningful water budgets, and associated vegetation dynamics for water-limited, dryland ecosystems.</td>
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<tr>
<td>WSM460A</td>
<td>Watershed Hydrology</td>
<td>Watershed hydrology looks at how water movement, storage and transformation on the Earth’s surface is influenced by landscape characteristics, including human modifications of those characteristics, and weather. As such, watershed hydrology will focus on surface water. However, this course offers a brief introduction to groundwater as it pertains to watershed hydrology.</td>
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<td>WSM531A</td>
<td>Tradition Ecological Knowledge</td>
<td>An introduction to the growing literature on traditional ecological knowledge and its relationships to the ecological and social sciences. Graduate-level requirements include preparing for and leading a class discussion on a specific topic.</td>
</tr>
<tr>
<td>WSM539A</td>
<td>Intro Dendrochronology</td>
<td>Survey of dendrochronological theory and methods. Applications to archaeological, geological, and biological dating problems and paleoenvironmental reconstruction. Emphasis on dating methods, developing tree-ring chronologies, and evaluating tree-ring dates from various contexts. Graduate-level requirements include a research paper reviewing critically some aspect of dendrochronology.</td>
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<td>WSM541A</td>
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<tr>
<td>WSM552</td>
<td>Dryland Ecohydro&amp;Veg Dynamics</td>
<td>Overview of ecological and hydrological interrelationships, including ecologically meaningful water budgets, and associated vegetation dynamics for water-limited, dryland ecosystems. Graduate-level requirements include different grading criteria and exam components plus completing a group research project in coordination with the instructor.</td>
</tr>
<tr>
<td>WSM560A</td>
<td>Watershed Hydrology</td>
<td>Watershed hydrology looks at how water movement, storage and transformation on the Earth’s surface is influenced by landscape characteristics, including human modifications of those characteristics, and weather. As such, watershed hydrology will focus on surface water. However, this course offers a brief introduction to groundwater as it pertains to watershed hydrology. Graduate-level requirement includes required completion of a graduate environmental inquiry through volunteer work. Graduate students will be required to blog about these experiences.</td>
</tr>
<tr>
<td>WSM595E</td>
<td>Tpcs in Dendrochronology</td>
<td>The exchange of scholarly information and/or secondary research, usually in a small group setting. Instruction often includes lectures by several different persons. Research projects may or may not be required of course registrants.</td>
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