DEPARTMENT OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY

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General Information

The Department of Geography and Environmental Sustainability (DGES) has three majors: Geography, Environmental Sustainability, and Geographic Information Science (GIS) which all offer a Bachelor of Arts or Bachelor of Science. Geography, Environmental Sustainability, and Geographic Information Science are all strongly interlinked. Together, they provide new ways of thinking and tools for understanding and managing the planet. Yet each is sufficiently distinct and provides different career paths and opportunities for students and practitioners.

Geography is made up of the study of two interrelated phenomena: spatial patterns (the why of where) and human-environment relationships (how people interact with where they live, work and play). Geography has a long and sometimes controversial history; geographers created maps of the world, and those maps were used to tell stories about how the world is, and what it ought to be. Contemporary geography includes the making of maps as well as critical examinations of their purposes and uses, but it is not limited to the study of maps. The discipline is often divided into three areas: physical geography (the study of the Earth's physical environments, features, and processes); human geography (the study patterns and dynamics of cultures, societies, economies and regions); and GIS (the study of geospatial information systems, spatial algorithms, and geovisualization). Many geographers find that the discipline is unusually supportive of work at the intersection between physical and social sciences, *making geography an important cognate to environmental and sustainability studies.*

Environmental Sustainability is a growing field that addresses how societies can meet the needs of the present without compromising the ability of future generations to meet their needs. Environmental sustainability has emerged as a field of study following recognition that the resources that support human life and make it comfortable are decreasing in quantity and quality while the demand and consumption for these resources continues to rise. Simultaneously, there is recognition that the issues involved, such as renewable energy resources, climate change, biodiversity loss, water resources, environmental justice, air and environmental quality etc., are cross-cutting issues that are not, and cannot adequately be, addressed by existing disciplines. Thus, there is need for new educational and research paradigms that weave environmental, economic and social issues together to provide students with an interdisciplinary education designed for dealing with such complex issues. Environmental sustainability degree holders are well-prepared for careers in state and municipal government, non-governmental organizations, and business. Graduates of this program will lead efforts in research, decision-making, and policies that underpin the drive for sustainable futures.

Environmental Studies (formerly the Interdisciplinary Perspectives on the Environment program) is a collaborative teaching and research program with a student-guided curriculum designed to create the leadership and workforce with the skills needed to help meet global challenges relating to water security and other pressing environmental issues, such as pollution, climate change, and deforestation.

The Environmental Studies program provides an undergraduate curriculum that leverages water and other environmentally-related strengths and expertise across the University of Oklahoma, and provides for scholarly specialization in water-related and other environmental disciplines, in order to prepare students to participate effectively in socially-responsible solutions to some of the greatest environmental problems facing humanity.

Environmental Studies prepares students for environmentally-related jobs, including those in federal, state, and tribal government agencies, environmental consulting firms, corporate, professional, and industrial enterprises, environmentally-related NGOs, journalism, public service, law, advocacy, and legislative lobbying efforts.

Geographic Information Science (GIS) is the science and technology of acquiring, analyzing, visualizing, and interpreting spatial data to enhance understanding, reveal relationships, patterns, and trends, and to support decision-making processes. Geographic Information Science includes the study, development and application of geographic information systems, remote sensing and global positioning systems (GPS). It is by nature multidisciplinary and has considerable applications in many disciplines including anthropology, biology, business management, ecology, energy management, engineering, geography, geology, meteorology, sociology, and urban and regional planning. GIS integrates methods from these different fields in order to solve problems and understand human, natural and physical systems from local to global scales. Any data that has geographic attributes can by analyzed and visualized in GIS to reveal information that is essentially not available using any other means. For these reasons, many businesses and organizations find GIS an indispensable part of routine operations and long term strategic planning. Several faculty members have strong research interests in applying GIS and remote sensing technologies to understand land use land cover change, ecosystem dynamics, and urban environments.

The department's educational mission and scholarship covers the entire spectrum of geography, environmental sustainability, and geographic information science. Faculty research interests in conservation biology, hydrology, global and tropical climatology, land-use land cover, and biogeography. In human geography, faculty research interests include urban and environmental politics, humanities and visual arts, economic and natural resource development, indigenous cultures, specific regions, such as Latin America, Africa, Russia and East Asia, and indigenous use of media. Research in environmental sustainability focuses on renewable energy resources principally, energy and wind power development, ecosystem valuation, and sustainability perception. Many faculty members make extensive use of geographical information systems (GIS) in both geography and environmental sustainability research, in addition to investigating cutting edge methodological issues in geographic information sciences.

Faculty members also use a wide range of quantitative and analytic methods, including statistics remote sensing, archival methods and qualitative methodologies. The faculty is involved in wide ranging research associated with areas including natural hazards, land-use and land cover change, water resources, applied climatology and sustainability. The faculty is currently working in many geographical

areas, including the United States, Canada, Latin America, Africa, the Middle East, and South and East Asia.

Thus, unique among all disciplines, geographic inquiry sits at the intersection of the social sciences, the humanities, and the natural sciences. Within the department, the research interests and expertise of faculty members cover the entire spectrum of geography including biogeography and human impacts on species distribution, applied climatology, renewable energy resources, hydrology and water resources, land cover and land use change, cultures, indigenous identities, political ecology, geohumanities, regional specialties, environmental policy and natural hazards.

Interested? Email us dges@ou.edu

Below are the current jobs our alumni have, the employment opportunities, and helpful links for each major:

Recent OU Geography Alumni - Employment

- Analyst at Inegra Realty Resources
- Assistant Planner at Association of Central Oklahoma Governments
- Associate GIS Analyst at Gulfport Energy Corp.
- Associate GIS Tech at OGE Energy Corp
- Bicycle & Pedestrian Coordinator at OK Dept. of Transportation
- Broadcast Meteorologist at TEGNA
- Community Development Specialist at City of Bethany
- EHS Data Analyst I at Chesapeake Energy
- Emergency Management Specialist, Kinston, North Carolina
- Engineering Tech at OGE Energy Corp
- GIS Tech at Aerotek
- Environment Project Specialist at Professionals Service Industries
- Environmental Services at Frito Lay
- Geospatial Analyst at Jeppesen
- GIS & Mapping Specialist at Reagan Smith Energy Solutions
- GIS Analyst at ConocoPhillips
- GIS Analyst at Enercon Services
- GIS Business Analyst III at Kalibrate
- GIS Mapping Specialist at Reagan Smith Energy Solutions
- GIS Specialist at Meshek & Associates
- GIS Specialist at ONEOK
- GIS Specialist at Zayo Group
- GIS Technician at Adecco Group
- Environmental Health Fellow with the U.S. EPA .
- Land Mapping Technologist at Encana Corporation
- Forensic Meteorologist at Weather Decision Technologies
- Mapping Support Specialist at Innovative Systems
- Marketing & Sales Coordinator at Weather Decision Technology
- Mesonet Calibration Lab Technician at Oklahoma Mesonet
- Officer in the U.S. Navy
- Project manager at Tulsa Regional Chamber of Commerce Regional Chamber of Commerce
- Sustainable Development & Transportation Planning at North Central Texas Council of Governments System
- Technician, General Dynamics Information Technology
- Technical Specialist at Baker Hughes
- Transportation planner with the North Central Texas Council of Governments

Recent OU Geography Alumni - Graduate School

- Ph.D. in Geography at the University of Maryland
- Ph.D. in Professional Counseling at Oklahoma State University
- Law Student at Penn State University
- Master of Arch at OU in landscape Arch and Urban Planning
- Master of Arts in Geography at The Univeristy of Oklahoma
- Master of Science in Geography at The University of Oklahoma
- Master of Public Health at The University of Oklahoma Health Sciences Center
- Master of City and Regional Planning at the University of North Carolina
- Master of Public Admin at George Mason
- Master in Geography and Spatial Planning at the University of Luxembourg

Career Options in Geography

- Climatologist
- Community Developer
- Community Resources Specialist
- Emergency Management
- Environmental Impact Analyst
- Environmental Scientist
- Facilities Planner
- Geointelligence Specialist
- Historic Preservationist
- Hydrologist
- Land Economist
- Land Use Analyst
- Location and Siting Analyst
- Logistics Analyst
- Map Analyst
- Map Curator / Librarian
- Natural Hazards Analys
- Natural Resources Manager
- Site Researcher
- Urban and Regional Planner
- Water Resources Specialist

Helpful Resources

Careers in Geography:
https://jobs.aag.org/jobs/
https://www.indeed.com/q-Geography-jobs.html

Professional Societies:
http://www.aag.org/
https://americangeo.org/

Recent OU Environmental Sustainability Alumni - Employment

- Environmental Programs Specialist II at OK. Dept. of Environmental Quality

- Air Quality Program Coordinator at Choctaw Nation of OK
- Brand & Content Strategist at Opower in San Francisco
- Business Development at CleanTX in Austin
- City Planner for the City of Amarillo
- District Executive for Boys Scouts of America in OKC
- Field Scientist at Terracon in Katy, TX
- Freshest Cargo Route Manager at Fresh Approach in San Francisco
- GIS Specialist at LandWorks, Inc. in Houston, TX
- Director of Marketing and Communications at CleanTX in Austin
- Retail Strategy Architect of Digital Innovation in Norman
- GIS Specialist for Brownsfields Program for Oil and Gas Conservation Division of OK. Corp. Commission
- Health and Safety Executive (HES) Officer. Innospec Oilfield Services in OKC
- Insurance Agent at Kemper in Georgia
- Associate Planner and Program Coordinator at the Office of Sustainability in OKC
- Quality Control Analyst at Cyanotech in Hawaii
- Brown Field Coordinator at Absentee Shawnee Tribe, Office of Environmental Health and Engineering
- Natural Resources and Sustainable Development (NRSD) Graduate porgram in WDC, American University School of International Service (SIS)
- Masters of City and Regional Planning Program, UNC; Graduate Asst. UNC Highway Safety Research Center on safe routes to school

Career Options in Environmental Sustainability

Government

- Sustainable community planner
- Green economic developer
- National Park ranger
- Municipal water conservation program manager
- Green team leader for city government
- Oklahoma Department of Environmental Quality
- Oklahoma Water Resources Board
- United States Environmental Protection Agency
- United States Office of Renewable Energy and Energy Efficiency
- United Nations Sustainable Development Officer

Business

- Green energy entrepreneur
- Corporate social responsibility manager
- Environmental consultant
- Energy auditor
- Environmental journalist
- ISO certification specialist

Nonprofit

- Executive director of a local environmental nonprofit
- State-level engagement coordinator for Greenpeace
- Fundraising and grant writer for Sierra Club
- Communications manager for World Wildlife Fund

Helpful Resources

Careers in ES:
https://www.ecojobs.com
https://www.sustainabilitydegrees.com/careers/

Professional Societies:
International Society of Sustainability Professionals
The Association of the Advancement of Sustainability in Higher Education
ISCN: International Sustainable Campus Network

Recent OU GIS Alumni - Employment

- OU GIS Alumni hold a variety of jobs in many differing career fields. Below is just a small example of these jobs:
- GIS Technician at the 9-1-1 Dept. of the Association for Central OK Government
- Geospatial Imagery Analyst at US Navy Reserve
- Cartography Technician in Kansas City at Garmin
- Design Technician, Charlotte County, Florida
- GIS Analyst, Williams
- GIS Analyst, KAMO POWER
- GIS Analyst I, Chesapeake Energy
- GIS Technician, Chickasaw Nation, Ada, OK
- GIS Analyst II, Williams, San Antonio, TX
- GIS Analyst at Muscogee Creek Nation
- GIS Analyst, Absentee Shawnee Tribe; Office of Env. Health and Eng.
- GIS Contractor, OGE Energy
- GIS Specialist, Oklahoma Dept. of Transportation
- GIS Technician, Apply, Austin TX
- GIS Tech, Chesapeake
- GIS Tech III, Chesapeake
- GIS Technician, Meshek & AssociatesGIS Technician at American Energy Partners
- GIS Technician, Apex Systems
- GIS Analyst, Chesapeake Energy
- GIS Analyst, Tapstone Energy
- Routing Technician, Oklahoma Environmental Management Authority
- SAP Specialist and Warehouse Lead Supervisor over the F119 Program, URS Corporation, An AECOM Company
- Software Engineer, Centuria
- IT Analyst II, The University of Oklahoma
- GIS Research Analyst, Templeton Demographics

Career Options in GIS

- Cartographic Design
- Computer Programming
- Data Analysis, Integration, Mining and Visualization
- Database Design and Management
- Disaster Response
- Environmental Analysis and Management
- Intelligence Analyst
- Imagery Analyst
- Logistics Planning and Support
- Planning (Urban, Transportation, Resources)
- Project Management
- System Administration
- Web Mapping

Helpful Resources

Careers in GIS:
http://www.mygisjobs.com/
GIS Jobs Clearinghouse
Discover Data Science

Professional Societies:
Oklahoma Geographic Information Council
South Central Arc User Group
URISA
GIS Professionals Volunteering for a Better World

Interested? Email Us DGES@OU.EDU

Programs & Facilities

Department offices are housed primarily on the fourth, fifth and sixth floors of Sarkeys Energy Center, while laboratories are located on the first floor of the same building. Available software includes ERDAS, ENVI, ARCMap, Microsoft Office products and SPSS for statistical analysis.

The department has labs for physical geography, GIS, cartography, and remote sensing. We also offer a DGES student only lab on the 6th floor and a collaborative space students can reserve on the 5th floor.

University resources include the Bizzell Memorial Library, which has an extensive collection of journals and books on geography and environmental sustainability, a large collection of maps and aerial photographs, and special collections in Western History, the History of Science, and the Geosciences.

The department also houses the Oklahoma Alliance for Geographic Education (OKAGE), an organization for geography educators in Oklahoma. OKAGE is affiliated with the National Geographic Society and its national network of state geographic alliances and national geography organizations. Also associated with the department are the experimental Geography studio, the Center for Spatial Analysis, the South Central Climate Science Center, and the Water-Energy-Food Institute (WEFI).

Environmental Research Experience for Students (ERES)

ERES is designed to provide undergraduate students with meaningful experience in scholarly research and creative activity focused on important environmental issues of the day.

Environmental Studies Related Internships

Internship experience with course credit is possibly for any student interested in getting a headstart on their career. See Internships for more information

Study Abroad

Students majoring in geography, environmental sustainability, and geographic information science are strongly encouraged to participate in the University's Study Abroad Program. Department advisors work closely with students to ensure that courses taken abroad will apply to their degrees. Our degrees offer a great deal of flexibility to allow for study abroad courses to count toward the degree plan. Students may study abroad in any of more than 100 cities across 50 countries around the world. Graduates of the program have studied abroad in Austria, Costa Rica, Ecuador, Ireland, Germany, Netherlands, Peru, the Galapagos Islands, and the United Kingdom (English and Scottish universities). The College of Atmospheric and Geographic Sciences offers the John T. Snow Study Abroad Scholarship; this $1,500 award is presented each year to a junior A&GS student who plans to study abroad, in addition to funding opportunities offered by OU through the Study Abroad Program.

Scholarships

The department offers 12 awards and scholarships (6 of which are endowed) which are used annually to recognize deserving students. The Ralph and Margaret Olson Scholarship Fund provides awards to students on the basis of high academic achievement; undergraduate majors are eligible after completion of the junior year. The Clyde Bollinger Award provides awards to graduating seniors who demonstrate outstanding scholarship and enthusiasm for geography. Additional awards and scholarships are provided annually to outstanding graduate and undergraduate students. The James Davis Geography Early Scholar Award and the Gress Family Scholarship are awarded to freshmen or sophomores who declare a major in geography or environmental sustainability in the freshmen or sophomore year. The Chair's award for Outstanding Senior Capstone is awarded each year to the student or team of undergraduate students that produce an original body of work judged to be the best by the faculty members.

Undergraduate Study

Bachelor of Arts and Bachelor of Science

All undergraduate students majoring in geography, environmental sustainability, or geographic information science are required to complete a core curriculum in the respective degrees, which provides students with an introduction to the major areas of geography and sustainability. Both the Bachelor of Arts and Bachelor of Science degrees contain electives that allow the student (in consultation with an advisor) to craft a degree program that meets their interests in the various facets of the fields. Students are encouraged to meet with the departmental faculty advisors early in the student's academic career to begin discussing the courses best suited to the student's interests.

- Environmental Sustainability, Bachelor of Arts
- Environmental Sustainability, Bachelor of Science
- Environmental Studies, Bachelor of Arts
- Geographic Information Science, Bachelor of Arts
- Geographic Information Science, Bachelor of Science
- Geography: Geohumanities, Bachelor of Arts
- Geography: Physical & Social Sciences, Bachelor of Arts
- Geography, Bachelor of Science

Accelerated Degree Programs

The department now offers accelerated Master's programs with any of our undergraduate degrees and a Masters in Regional and City Planning.

- Environmental Sustainability: Planning & Management, Bachelor of Arts/Master of Regional & City Planning
- Environmental Sustainability: Planning & Management, Bachelor of Science/Master of Regional & City Planning
- Geographic Information Science, Bachelor of Arts/Master of Regional & City Planning
- Geographic Information Science, Bachelor of Science/Master of Regional & City Planning
- Geography: Physical & Social Sciences, Bachelor of Arts/Master of Regional & City Planning
- Geography, Bachelor of Science/Master of Regional & City Planning

Minors

Minors offered by the OU Department of Geography and Environmental Sustainability (DGES) provide complimentary knowledge for a variety of careers and degrees. By combining the study of environmental issues and research methods, social, economic, energy and policy considerations, and digital technologies and their applications, our minors prepare graduates to better comprehend and contribute to addressing real-world social and environmental issues.

- Climate Adaptation, Minor
- Environmental Sustainability, Minor
- Environmental Studies, Minor
- Geographic Information Systems, Minor
- Geography, Minor
- Hydrologic Science, Minor
- Physical Geography, Minor

Graduate Study

Master of Arts/Master of Science

The Master of Arts and Master of Science degrees certify that a student has a professional grasp of the concepts and techniques of geography/environmental sustainability and has demonstrated competence and originality in their use. The degrees can be acquired by one of two methods-a thesis option or a non-thesis option.

- Master of Arts, Geography and Environmental Sustainability
- Master of Science, Geography and Environmental Sustainability: Environmental Systems
- Master of Science, Geography and Environmental Sustainability: Geospatial Technologies

Online Graduate Degrees

- Master of Science, Geography and Environmental Sustainability: Geospatial Technologies

Graduate Certificates

Students interested in pursuing Geospatial Technologies Graduate Certificate must be currently enrolled in a graduate program at the University of Oklahoma.

Doctoral Programs

The Geography and Environmental Sustainability Ph.D. certifies that a student has mastered a significant body of geographical knowledge and has demonstrated a high degree of professional competence as a geographer by making an important, original contribution to knowledge.

All Ph.D. students must identify an advisory committee which will consist of the advisor and four other faculty members, one of whom must be from a discipline other than geography.

Students are expected to declare provisional specialties, in consultation with the advisory committee, by the end of the second semester of residence in the Ph.D. program. Coursework requirements in connection with this specialty, as well as with the cognate field, are determined by the student and the advisory committee in a formal conference held before the end of the first year of residence.

Each student must select a cognate field or discipline related to their area of specialization. The advisory committee must approve both the cognate field and the courses which fulfill this requirement.

The readiness of a student to proceed with dissertation research will be evaluated by a proposal as well as written and oral examinations. The proposal presentation will be open to the general public and must be announced in advance, giving the entire department and public a chance to participate. A written statement of the proposal shall be given to each member of the dissertation committee and to the remaining members of the faculty. The comprehensive examinations will be administered by an examining committee of five faculty members, three from geography and at least one external committee member. The written portion of the examination will cover the degree specializations and cognate field. The examination will be prepared by the advisor from questions suggested by members of the examining committee. The oral examination will consist of follow-up questions related to the written portion and to the student's knowledge of geographic thought and methodology. Satisfactory completion of the written and oral portions of the general examination is followed by formal certification of candidacy for the Ph.D. degree.

The final requirement is the preparation and oral defense of a Ph.D. dissertation, which must be a major piece of research recognized by the dissertation committee as a significant contribution to knowledge. The dissertation committee must consist of at least five faculty members; three or more of them must be faculty members in the department and also on the geography graduate faculty of the University. Members of the advisory committee will normally remain as members of the examination and dissertation committees. All changes in committee membership must be forwarded to the Graduate College for approval at least 30 days prior to defense of the dissertation.

After advancement to candidacy for the Ph.D. degree, a student is expected to submit a dissertation manuscript within four years. After this time, at the discretion of the Department of Geography faculty, the student may be required to repeat the general examinations and/or to resubmit a dissertation proposal as a condition for remaining a degree candidate. As long as there is clear evidence that a student is making progress and is keeping up-to-date professionally, the four-year time period may be extended on recommendation of the dissertation committee. Experience shows, however, that long delays tend to increase the likelihood of problems in completing a dissertation.

The final defense of the dissertation will be scheduled only after the committee has agreed to approve the draft as nearly complete. Procedures for this defense shall follow those outlined by the Graduate College. Major points of conflict regarding substance or style should be resolved before the final defense. However, minor additions and revisions may be expected after the defense.

Courses

ENST 1013 Consumption and the Environment 3 Credit Hours
An introduction to the interdisciplinary aspects of human consumption and the environment. Aspect of the production and consumption of food, energy, transportation, and housing are considered for their contributions to global climate change, air and water pollution, and habitat alteration, as well as other relevant topics regarding the environment. Students will learn how complex interactions between natural processes and human activities shape aspects of the global, regional and local environment. (F, Sp) [III-SS].

ENST 2003 Water Resources Advocacy 3 Credit Hours
Water is commonly considered the world's "new oil." Experts vow that water scarcity may ultimately lead to the next world war. This course will provide insight and understanding of challenges, decisions, and advocacy in ecologically and economically sustainable management of water resources, as well as the seriousness of what water scarcity means using national and global case studies. (F)

ENST 2023 American Environmental Perspectives 3 Credit Hours
Prerequisite: sophomore standing or permission of instructor. Based on the relationships between people and the natural world, with a focus on natural, social, and institutional systems in the US, and our shared goals for sustainability, this course explores the role of nature in fulfilling human needs, as well as how American society influences and impacts nature at local, regional, national, and global scales. (F)

ENST 2203 Ecosystem Impacts of Climate Change 3 Credit Hours
Rising temperatures, changing rainfall patterns, rising sea levels and increasing atmospheric carbon dioxide have direct effects on living creatures and the Earth's climate system, which also spawn many indirect changes in ecological systems. This non-majors course will cover the basic of why climate is changing, its effects on plant and animal physiology and behavior, and its impact on the ecosystem. (Su) [II-NS].

ENST 2813 Environmental Studies Cornerstone 3 Credit Hours
Prerequisite: ENST majors and minors only; departmental permission required; Corequisite: ENST 3891. This course introduces students to the Environmental Studies program. It offers students an overview of environmental teaching and research at OU, and emphasizes the importance of integrating disciplinary perspectives on environmental topics. (F, Sp)

ENST 2970 Special Topics 1-3 Credit Hours
Special Topics. 1 to 3 hours. May be repeated; Maximum credit nine hours. Special topics course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research, and field projects. (Irreg.)

ENST 3023 Environmental Psychology 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Examines the interplay between human behavior and the environment, both natural and built. Topics include place identity and place attachment, the cognitive hierarchy and human behavior, the influence of design on behavior, biophilia and behavioral inheritance, the psychology of crowding, environment and health, and research applications. (Sp)

ENST 3213 Law and the Environment 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Examines the general underlying foundations of the United States constitutional principles. Study of the constitutional and structural conflicts when environmental law is at issue. The focus of the class will shift to practical information and exercises regarding environmental law. Finally, the class will study the three sections of specialized law and their interrelationship with the environment. (Irreg.)

ENST 3223 Environmental Justice 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Examines the impact of industrial societies on human beings, especially minority and low income populations. Students are introduced to evidence of disproportionate impact in certain populations, potential causes of the problems, theoretical concepts of environmental justice and how some of these concepts may be implemented to solve problems affecting the various communities. Additionally, students will review the legal and social implications, as well as potential methodology that is defining, refining, and shaping the environmental justice landscape. (Irreg.)

ENST 3243 Introduction to Water Law 3 Credit Hours
Prerequisite: English 1213/Expository Writing 1213, junior standing or permission of instructor. Provides an understanding of the fundamental tenets of water allocation in the United States. Topics include the Clean Water Act and its effect on resolving complex pollution issues, competing uses of water, riparian doctrine, prior appropriation, the public trust doctrine, nonpoint source pollution, and oil spills and hydraulic fracturing. (Sp)

ENST 3263 Ecotourism: Sustainable Wildlife and Nature Tourism 3 Credit Hours
Prerequisite: ENST 1013 or ENST 2623, junior standing, or permission of instructor. Using case studies and small student group projects, this course explores ecotourism or sustainable wildlife and nature tourism across the broad array of beneficial features, such as protection for a species and income generation for local people, as well as some of ecotourism's less-sustainable and potentially harmful aspects. (F)

ENST 3303 Food, Agriculture, and the Environment 3 Credit Hours
Prerequisite: junior standing or permission of the instructor. Food production, both large scale and small scale, has impacts on the environment. From erosion to water pollution to intensive use of fossil fuels, these impacts affect a variety of environmental elements. Since most of us buy our food pre-packaged at the supermarket, we do not see these impacts, nor typically are these impacts reflected in the price we pay. Most of our food arrives from far away, transported over long distances, in many cases from the southern hemisphere. This class will examine the impact of our food production systems on all aspects of the environment including air, soil, and water, as well as its demands and impacts on energy production. (Irreg.)

ENST 3313 Gardening, Community, and the Environment 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Explores fundamental concepts and styles of gardening with an emphasis on edibles and organic methods. Class assignments help students connect gardening to environmental and community issues at the personal, local, regional, and global levels. A service learning component promotes hand-on experiences and responsibility to the community. (Irreg.)

ENST 3440 Mentored Research Experience 3 Credit Hours
0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

ENST 3463 Water and Ecological Sustainability 3 Credit Hours
(Crosslisted with BIOL 3463) Prerequisite: junior standing and English 1213 or Expository Writing 1213, Biology 1114 or Biology 1124 or Biology 1134, or permission of instructor. Objective of the course is to allow students to examine and discuss important historical and current issues relating to the interactions between socio-economic use of water resources and ecosystem biodiversity, function, and sustainability. (F) [II-NS].

ENST 3503 Energy Use, Climate Change, and the Environment 3 Credit Hours
Prerequisite: junior standing or permission of instructor. The way we live in the modern industrialized world is extremely energy intensive. We will examine our energy use across all sectors, from the fuels used to generate the electricity to run our computers to the energy we are most familiar with, that which we use to fill our cars. (Irreg.)

ENST 3603 Global Perspectives of Wildlife Conservation 3 Credit Hours
Prerequisite: junior standing or permission of instructor. A conservation biology course with primary attention aimed at wildlife. Explores the complex relationships that exist between humans and wildlife throughout the world. Group activities and detailed assessment of case studies will introduce students to finding solutions to threats that can provide wildlife conservation in a way that is also beneficial (or at least not harmful) to humans. (F)

ENST 3613 The Politics of Wildlife Conservation 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Exploration of the politics of wildlife conservation from a variety of perspectives. Review the history of our own species' impact on the lives of free-ranging animals and examine the many ways that human-wildlife symbiotic relationships have influenced biodiversity loss and growth. Students will learn about the process of implementing national laws and international treaties aimed at conserving wildlife, while also practicing methods of working with local people and key decision makers. Through a series of problem-solving activities and assessment of several relevant case studies, we will focus on the more general "politics" of wildlife conservation. (Irreg.)

ENST 3633 Wilderness Philosophy 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Explores the concept of wilderness as a human construct. Provides an overview of the various Western perspectives of wilderness; from the early prehistoric and colonial American views of wilderness, through the inception and designation of federally recognized Wilderness, to the current debate regarding the role of wilderness in contemporary society. (Su)

ENST 3653 Community Conservation 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Community conservation involves local people, often working with conservation scientists, protecting and conserving their natural resources. The principles of community conservation are similar globally, but each community conservation project will differ depending on location, habitat type, and the status of wildlife species involved. Select case studies of successful programs will be examined as bases for hypothetical student community conservation projects. (Sp)

ENST 3663 Hot Topics in Wildlife Conservation 3 Credit Hours
Prerequisite: ENST 2623 or ENST 3613 or permission of adviser or instructor. Examines the latest technologies used in the field of conservation, new advances in human-wildlife conflict mitigation, updates on political approaches to conservation, and other current conservation news, with emphasis on large African mammals. Provides an opportunity to learn more about how interested stakeholders come together to develop national wildlife policies and conservation action plans. (Su)

ENST 3713 Nature in the City 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Given that the vast majority of the Earth's land area has had some kind of human impact, this class will examine how we can maximize the potential of human-altered habitats to support native species, facilitate population exchange, and support wildlife conservation. Additionally, we'll examine how urban plant and animal populations affect people.

ENST 3723 Issues in Ecological Restoration 3 Credit Hours
Prerequisite: ENGL 1213 or EXPO 1213, junior standing or permission of instructor. This introduction to the field of restoration ecology will cover philosophical, societal, and scientific aspects of restoring habitats and ecosystems. (Sp)

ENST 3743 Biological Invasions and Society 3 Credit Hours
Prerequisite: junior standing or permission of instructor. New species arrive on our shores daily; some of these species become so problematic that we label them "invasive." Explores some of our views of invasive species, what makes a species invasive, how they spread, what their impacts are on human and natural systems, whether or not all invasive species are bad, and what can be done to control them. (Sp)

ENST 3800 Environmental Internship 1-3 Credit Hours
1 to 3 hours. Prerequisite: junior standing and permission of IPE coordinator. Supervised work experience at a business, government or non-profit agency, dealing with an environmental issue. May require specific preparation, as appropriate. S/U grade based on completion of advance preparation, if any; evaluation by workplace supervisors; and coordinator's evaluation of a report on the issue dealt with during the internship. (F, Sp, Su)

ENST 3891 Environmental Studies Learning Community 1 Credit Hour
Prerequisite: ENST 2813 (or concurrent enrollment); ENST majors and minors only; departmental permission required; may be repeated; maximum credit 3 hours. The Learning Community course gives Environmental Studies majors the opportunity to enrich their classroom experience, through a variety of activities including structured interactions with other students; presentations on academic and policy topics; workshops on career planning; and environmentally related service projects. (F, Sp)

ENST 3893 Environmental Studies Research Project 3 Credit Hours
Prerequisite: ENST 2813; ENST majors and minors only; departmental permission required; Corequisite for majors: ENST 3891, if offered. An independent study into an environmental issue with one or more faculty researchers. This class provides experience with academic inquiry, and the integration of multiple disciplinary perspectives. ENST 2813 (Environmental Studies Cornerstone) is a prerequisite because in that class students will choose and plan research projects matching their own interests. (F, Sp, Su)

ENST 3913 Special Topics in Environmental Studies 3 Credit Hours
Prerequisite: junior standing or permission of instructor. May be repeated with change of content; maximum credit nine hours. Designed to permit the study of specific and changing issues and problems in environmental studies. (Irreg.)

ENST 3950 Environmental Research Experiences for Students (ERES): Practical Research 1-3 Credit Hours
1 to 3 hours. Prerequisite: ENST 3940 or concurrent enrollment. A semester-long course in which a student works independently with a faculty researcher to gain experience and understanding in active research within a specific discipline. (F, Sp, Su)

ENST 3960 Honors Reading 1-3 Credit Hours
Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. The topics will cover materials not usually presented in regular course work. (Irreg.)

ENST 3970 Honors Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Subjects covered vary. Deals with concepts not usually treated in regular courses. (Irreg.)

ENST 3980 Honors Research 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors program. May be repeated; maximum credit six hours. Provides an opportunity for the Honors candidate to work at a special project under the guidance of a professor on a specific environmental related issue. (Irreg.)

ENST 3990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor and junior standing. May be repeated once with change of content. Independent study may be arranged to study a subject not available through regular course offerings. (F, Sp, Su)

ENST 4883 Environmental Studies Seminar 3 Credit Hours
Prerequisite: ENST 2813, ENST 3893, ENGL 1213 or EXPO 1213, and permission of department; Majors only; Repeatable with change of content; maximum credit 6 hours. Intensive study of interdisciplinary approaches to environmental issues, typically through close reading of major academic works that integrate multiple disciplines. Content will vary by instructor. (F)

ENST 4893 Environmental Studies Capstone 3 Credit Hours
Prerequisite: Majors only; ENST 4883. Students will work in interdisciplinary teams to propose a scientifically informed and ethically justified policy response to a local or regional environmental concern. Content will vary by semester. (Sp) [V].

ENST 4960 Directed Readings 1-4 Credit Hours
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)

ENST 4970 Seminar 1-3 Credit Hours
Prerequisite: junior standing or permission of instructor. May be repeated with a change of content; maximum credit six hours. Interdisciplinary topics with regard to the environment; May include field work, special presentations, or other activities not covered in regularly scheduled courses. (Irreg.)

ENST 4990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: junior standing or permission of instructor. May be repeated; maximum credit six hours. Contracted independent study for a topic not currently offered in regularly scheduled coursework. May include library and/or research and field projects. (Irreg.)

ENST 5053 Advanced Environmental Studies 3 Credit Hours
Prerequisite: graduate standing. An interactive seminar featuring discussions of assigned readings, student presentations, and guest lectures. Topics covered will cross the environmental studies spectrum, from basic ecological principles and approaches to public and agency communication, and will include treatment of historical, policy, and legal perspectives of environmental issues. (Sp)

ENST 5960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisites: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member affiliated with the Environmental Studies program. (F, Sp, Su)

ENST 5980 Research for Master's Thesis 2-9 Credit Hours
Prerequisite: graduate standing. Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)

ENST 5990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)

GEOG 1103 Human Geography 3 Credit Hours
An introduction to the humanized Earth; specifically, to the geography of population, the global pattern of cultures and such affiliated elements as language, religion, technology, and political organization, and to the physical expression of those cultures in rural and urban settings. (F, Sp, Su) [IV-WC] .

GEOG 1113 The Language of Maps 3 Credit Hours
Introduction to reading, analyzing and interpreting graphic information symbolized on a wide variety of maps. Topics include: scale, projection, generalization, symbolization, statistical map techniques, coordinate systems, interpreting human and physical landscapes on topographic maps and web-based mapping services, controversies about place names, political gerrymandering, and cartographic innovations. (Sp) [I-O].

GEOG 1114 Physical Geography 4 Credit Hours
A systematic introduction to the physical Earth; including Earth materials, landform processes and resultant landforms, Earth-sun relations, weather, climate, the water cycle, natural vegetation, and soil types. Emphasis is placed on the inter-relationships among these phenomena. (F, Sp, Su) [II-NSL] .

GEOG 1203 Global Environmental Issues 3 Credit Hours
This course is an "interactive" lecture/discussion course, and integrates environmental content with selected readings, hosts guest experts and connects students with real world applications. The myriad of environmental issues and concepts expressed by various media that impact us directly and indirectly will be academically explored. (F, Sp) [III-SS].

GEOG 1213 Economic Geography 3 Credit Hours
A survey of the contemporary global economy and of the analytical approaches developed by geographers studying it. Economic systems are examined at the household, urban, regional, national, and international levels. Special attention is given to changes in resource use, regional specialization, trade, industrial and retail location, and modernization. (F, Sp) [III-SS] .

GEOG 2021 Exploring DGES 1 Credit Hour
Prerequisite: Majors only. An immersive course designed to introduce students to The Department of Geography & Environmental Sustainability (DGES). Students investigate and practice what it means to be an environmental sustainability, geographic information science, or geography major. Provides foundational knowledge for researching, designing, and implementing each student's DGES degree for a successful collegiate experience and create a sense of belonging and community. (F)

GEOG 2603 World Regional Geography 3 Credit Hours
A broad survey of the world's major culture regions emphasizing basic physical, cultural, economic, and political patterns, as well as the processes that have created those patterns. Emphasis on economic development, ethnic conflict, and environmental degradation, as well as on the changing role of the United States. (F, Sp, Su) [IV-WC] .

GEOG 2970 Special Topics/Seminar 1-3 Credit Hours
Special Topics. 1 to 3 hours. May be repeated; Maximum credit nine hours. Special topics course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research, and field projects. (Irreg.)

GEOG 3003 Interpreting Planet Earth 3 Credit Hours
Prerequisite: junior standing or permission of instructor. This one semester, dynamic course integrates human and physical geography. Understanding our planet, its people, issues and global activities will involve "hot topic" discussions, case studies, a team project, plus two outside class field-based activities. (Sp) [III-SS].

GEOG 3023 Principles of Physical Geography 3 Credit Hours
Prerequisite: junior standing or permission of instructor. This course is designed to explain important physical geographical processes and phenomena, the interactions among these phenomena, and their relationship with various human activities. The course provides a solid foundation for upper level physical geography courses including biogeography, climatology, geomorphology, and hydrology. (Sp)

GEOG 3043 Living With Nature 3 Credit Hours
Prerequisite: Junior standing or department permission. Examine the forces of nature that cause disruptions and disasters which includes the process that produces storms, hurricanes, wildfires, droughts, etc. Each topic will include an examination of the causes of those events, where and how often they occur, and the risks they pose to people and society and what actions are needed to reduce or prevent impacts. (Sp) [II-NS].

GEOG 3133 Geography of Beer, Wine and Spirits 3 Credit Hours
Prerequisite: Junior standing. This course introduces you to the cultural and historical landscapes that made/make beer, wine, and spirits possible. The course is a rapid introduction to help bring an appreciation to these these industries. Analysis of physical and cultural forces which shape the production, consumption and variety of these beverages. (F, Sp)

GEOG 3213 Principles of Human Geography 3 Credit Hours
Prerequisite: upper-division standing or permission of instructor. Introduction to the distribution of humans and their activities on the surface of the earth and the processes that generate these distributions. Special attention given to the influence of economy, culture, and politics in shaping the land and the spatial character and organization of human life. A key theme is the relationship of human diversity and places to the environment. (F)

GEOG 3233 Principles of Sustainability 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Provides a broad introduction to the basic principles of sustainable development with an examination of its social, economic, and environmental dimensions. Students will learn about sustainability strategies and practices from a national and international perspective with attention paid to the ethical and cultural aspects integral to a transition to sustainability. (F)

GEOG 3243 Principles of Economic Geography 3 Credit Hours
Prerequisite: junior standing or permission of instructor. An examination of the distribution of economic activities and the processes that generate them. Special attention is given to principles of economic location and their application to patterns of production, consumption, and exchange. Contemporary approaches to economic geography are critiqued, including relational economic geography, the creative economy, and environmental economic geography. (Sp)

GEOG 3253 Environmental Conservation 3 Credit Hours
Contemporary environmental issues and policies. Problems of population growth, food production, energy shortages, resource depletion and pollution impacts will be stressed. The social aspects of conservation management policies will be viewed at both global and national scales. (F) [III-SS] .

GEOG 3440 Mentored Research Experience 3 Credit Hours
0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

GEOG 3443 Environment and Society 3 Credit Hours
Prerequisite: junior standing or permission of instructor. An introduction to the political, economic, and cultural factors that shape human-environmental relations around the world. Special attention is placed on how societies come to value the environment differently, how people struggle over access to and control of natural resources, and the social causes and consequences of environmental change. (F) [III-SS].

GEOG 3513 Political Geography 3 Credit Hours
Prerequisite: junior standing. A survey, stressing current geopolitical conflicts. Special topics include the nation-state, territoriality, the legacies of colonialism, spheres of political influence, regional conflicts, and geopolitics in such areas as Europe and the Pacific Rim, demographic and resource considerations in world politics, and emerging culturally based conflicts. (F, Sp, Su) [IV-WC] .

GEOG 3523 Managing for a Changing Climate 3 Credit Hours
(Crosslisted with METR 3523) Prerequisite: Junior or Senior standing. Provides an integrative understanding of the components of the climate system including the range of natural climate variability and external drivers of climate change, in addition to impacts of a changing climate on multiple sectors such as the economy, policy, ecosystems, and indigenous populations. (F) [II-NS].

GEOG 3773 Geography of the United States 3 Credit Hours
Prerequisite: Junior standing or permission of instructor. An introduction to the regional character of the United States, including its physical, social, and economic elements. (Irreg.)

GEOG 3843 Gender and Environment 3 Credit Hours
Prerequisite: junior standing or permission of instructor. Critically examines the concepts of environment and gender. Particular emphasis is placed on how and why environmental inquiry and academic advocacy intersect. Students will study the organizational practices, institutional policies, and cultural politics with which the concepts of gender and environment are composed, conveyed, and contested. (Sp) [III-SS].

GEOG 3890 Selected Studies in Geography 3 Credit Hours
1 to 3 hours. Prerequisite: junior standing. May be repeated with change of subject matter; maximum credit nine hours. To be used for special intersession courses and occasional (irregularly scheduled) courses of special concern and use for the undergraduate. (F, Sp)

GEOG 3923 Quantitative Methods 3 Credit Hours
Prerequisite: junior standing and completion of a lower division general education math requirement. Introduces students to methods of collecting, organizing, and describing data, focusing specifically on environmental and geographical applications. Students also learn basic concepts of probability and statistical inference. The overall objective is to develop an understanding of statistical literacy as it is applied to geographical and sustainability related issues. (F, Sp)

GEOG 3930 Field Techniques for Geographers 1-4 Credit Hours
1 to 4 hours. Prerequisite: twelve hours of geography or permission of instructor. May be repeated with change of subject matter; maximum credit six hours. Basic methods of data acquisition: surveying, measuring, sampling, sketching, and mapping. Individual and group projects may be required. (Irreg.)

GEOG 3960 Honors Reading 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. Covers materials not usually presented in the regular courses. (F, Su)

GEOG 3970 Honors Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. The projects covered will vary. Deals with concepts not usually presented in regular coursework. (Irreg.)

GEOG 3980 Honors Research 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Provides an opportunity for the gifted Honors candidate to work at a special project in the student's field. (F, Sp, Su)

GEOG 3990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor and junior standing. May be repeated once with change of content. Independent study may be arranged to study a subject not available through regular course offerings. (F, Sp, Su)

GEOG 4003 The Global City and Planning Issues 3 Credit Hours
(Crosslisted with RCPL 4003; Slashlisted with 5003) Prerequisite: English 1213 and junior standing. An introduction to the concept of globalization and its effects on cities, and the city planning issues related to those effects. Characteristics, theories, and strategies of city development are reviewed. Cities are observed from several perspectives: natural and built environment, governance, society, economics, and history. No student may earn credit for both 4003 and 5003. (Sp)

GEOG 4023 Geography of Health and Disease 3 Credit Hours
(Slashlisted with GEOG 5023) Prerequisite: Junior standing or department permission. This course offers a holistic view on "one health" by linking health and disease outcomes to the socio-cultural and physical environment, and the places that generate them. Lectures and discussion/lab sections will focus on basic concepts, principles, and methodologies in health studies, landscape epidemiology, global health under changing climate and environment, health disparities, healthcare and medical service planning. No student may earn credit for both 4023 and 5023.

GEOG 4033 Human Dimensions of Global Environmental Change 3 Credit Hours
(Slashlisted with GEOG 5033) Prerequisite: Junior Standing. The earth has been radically transformed by human action. This course explores the human-induced "why" and the extent of global environmental change. The need to explain, predict and prevent such change led to the development of transdisciplinary approaches examining complex human-environmental relationships. Course discusses the current, international global environmental science research agendas within the context of social and environmental justice. No student may earn credit for both 4033 and 5033. (Sp)

GEOG 4043 Urban Climatology 3 Credit Hours
(Slashlisted with GEOG 5043; Crosslisted with METR 4043) Prerequisite: Junior standing or departmental permission. This course provides an overview of urban climates based on a synthesis of modern scientific and applied research findings. The course covers a broad spectrum of topics such as urban airflow, radiation exchanges, urban energy balance, urban heat island, urban surface hydrology, air pollution, cities under global climate change, biometeorology, and sustainable urban design and planning. No student may earn credit for both 4043 and 5043. (Sp)

GEOG 4123 Cities and Society 3 Credit Hours
(Slashlisted with GEOG 5123) Prerequisite: Junior standing or permission of instructor. The course introduces students to the geography of cities--history of cities in human society, connections between urban policies and social outcomes, challenges in constructing a city that works for all. Key concepts include city planning, industrialization, housing, transportation, social/racial/environmental justice, gentrification, and the future of cities. No student may earn credit for both 4123 and 5123. (F)

GEOG 4183 Patterns and Processes in Landscape Ecology 3 Credit Hours
(Slashlisted with GEOG 5183) Prerequisite: Junior standing. This course will identify and evaluate the central constructs and methods of landscape ecology, focusing on the role of humans in creating and affecting landscape patterns and processes. Topics covered include fundamentals/frameworks of landscape ecology; how spatial patterns influence ecosystem, management, and conservation; how to quantify spatial pattern; and how to identify general drivers of landscape pattern. No student may earn credit for both 4183 and 5183. (F)

GEOG 4200 Internship in Geography 1-6 Credit Hours
1 to 6 hours. Prerequisite: Permission of instructor and junior standing. May be repeated; maximum credit 6 hours. A student must secure their own internship that provides career training experience whereby students may apply geographical or environmental skills and develop further professional capabilities in a realistic setting. Students must complete internship hours and reflective coursework provided by faculty member to obtain credit. (F, Sp, Su)

GEOG 4273 Regional Climatology 3 Credit Hours
(Slashlisted with GEOG 5273) Prerequisite: junior standing or permission of instructor. Investigates the nature of the Earth's climate and provides an examination of ideas about atmospheric circulation. Topics include radiation, the hydrologic cycle, general circulation, local and regional climates, and global climate change. Specific attention is focused on the climatic water budget, its utility in evaluating local and regional climates, the role of climate models, and issues in applied climatology. No student may earn credit for both 4273 and 5273. (Irreg.) [II-NS].

GEOG 4283 Biogeography 3 Credit Hours
(Slashlisted with GEOG 5283) Prerequisite: junior or senior standing. Biogeography is the study of the spatial distribution, past and present, of plant and animal species and biodiversity. Course topics include factors affecting the distribution of species, the role of biogeography in biological conservation and understanding a changing world. No student may earn credit for both 4283 and 5283. (F)

GEOG 4293 Hydrologic Science 3 Credit Hours
(Slashlisted with GEOG 5293) Prerequisite: Math 1823 or 1914 and either Physics 2414, 2514 or Chemistry 1315. Study of the processes which control the storage and movement of water at global, regional, and local scales. The emphasis is on the land portion of the hydrologic cycle, and includes the study of processes such as infiltration, soil water flow in the saturated and unsaturated zone, rainfall/runoff and evaporation. Lab sections include exercises on a computer in the field and in a soils lab. No student may earn credit for both 4293 and 5293. (Sp)

GEOG 4313 Interpreting Society and Environment: Qualitative Research Methods 3 Credit Hours
(Slashlisted with GEOG 5313) Prerequisites: junior standing. This class approaches qualitative research methods from the perspective of human geography. That makes it especially useful for students who want to investigate the intersections of social and environmental relationships: be they historical, contemporary, or future (as in planning). No student may earn credit for both 4313 and 5313. (F)

GEOG 4343 Climate, History, and Society 3 Credit Hours
(Slashlisted with GEOG 5343) Prerequisite: junior standing or permission of instructor. This course is an overview of the mutual interactions of climate and human activities, and examines historical examples of significant climatic impacts. The course includes investigation of the nature of earth's climate and a synthesis of contemporary scientific ideas about the climate and its environmental and societal impacts. No student may earn credit for both 4343 and 5343. (Irreg.) [II-NS] .

GEOG 4423 Environmental Justice 3 Credit Hours
(Slashlisted with GEOG 5423) Prerequisite: Junior standing. This course will cover environmental injustices related to environmental hazards (e.g., air and water pollution, toxic and hazardous waste, industrial byproducts) as well as injustices related to environmental benefits (e.g., access to parks, greenery, and clean environments). Throughout the course, we will engage with environmental racism. No student may earn credit for both 4423 and 5423. (Sp) [III-SS].

GEOG 4513 Real-world Applications of Climate and Weather Information 3 Credit Hours
(Slashlisted with GEOG 5513) Prerequisite: MATH 1823 and PHYS 2514. The purpose of this class is to broaden the perspective of students to the use of climate information in agriculture, energy, water resources, public health, and other areas of society. Field trip. No student may earn credit for both 4513 and 5513. (Sp)

GEOG 4523 Life Cycle Analysis 3 Credit Hours
(Slashlisted with GEOG 5523) Prerequisite: junior standing or permission of instructor. This course provides students with an understanding of Life Cycle Analysis both with respect to its conceptual foundations as well as its applications across a variety of socially important sectors. No student may earn credit for both 4523 and 5523. (Sp)

GEOG 4563 American Indian Geographies 3 Credit Hours
Prerequisite: upper-division standing. A survey of the geographical knowledge among Indians in North America. Historical and contemporary topics are covered in a cross-cultural perspective including land use, environmental perception, concepts of space and place, symbolic landscapes, sacred land, and the idea of resources. (Sp) [IV-WDC] .

GEOG 4583 Energy Systems and Sustainability 3 Credit Hours
(Slashlisted with GEOG 5583) Prerequisite: Junior standing or permission of instructor. An understanding of interdisciplinary elements and perspectives associated with energy systems in the context of sustainability. It examines current and future energy supply, transmission, and demand management options. A critical focus on the economic, social, and environmental implications of energy system transitions will help identify energy technology and infrastructure solutions while understanding the institutional and organizational changes necessary for implementation. No student may earn credit for both 4583 and 5583. (F)

GEOG 4653 Urban Sustainability: Nature, Justice, and the City 3 Credit Hours
(Slashlisted with GEOG 5653) Prerequisite: Sophomore standing and ENGL/EXPO 1213, or instructor permission. This course explores the sustainability challenges our cities face and how we might address them from critical perspectives in urban studies, planning, and geography. Through guest speakers, films, field trips and reading discussions, we will learn about the historical, multi-spatial, political, and representational dimensions of urban sustainability, and analyze the implications of different approaches to urban sustainability. No student may earn credit for both 4653 and 5653. (F)

GEOG 4663 Water and Society 3 Credit Hours
(Slashlisted with GEOG 5663) Prerequisite: Sophomore standing and ENGL/EXPO 1213, or instructor permission. To examine assumptions and understanding of the accessibility, quality, and distribution of water, the forces driving social change related to water, and the likely course of water and society issues in the future. A major objective is to challenge students to critically think about policy, and how we might develop effective, equitable, and just water policy for the 21st Century. No student may earn credit for both 4663 and 5663. (F)

GEOG 4713 Dynamic Modeling of Socio-Environmental Systems 3 Credit Hours
(Slashlisted with GEOG 5713) Prerequisite: Senior standing or permission of instructor. This course is an overview of the use of modeling and simulation to document, analyze, and project the dynamic behavior of socio-environmental systems. The course covers an introduction of basic modeling and simulation terminology and three different approaches to modeling temporal and/or spatial dynamics: system dynamics modeling, agent-based modeling, and cellular automata. No student may earn credit for both 4713 and 5713. (Sp)

GEOG 4753 Transportation Geography and Planning 3 Credit Hours
(Slashlisted with GEOG 5753; Crosslisted with RCPL 4753) Prerequisite: Junior standing. This course is intended to introduce students to the world of transportation planning and geography by explaining the importance of transportation from local to global and by engaging them in everyday transportation activities. Topics include, but not limited to, the history of transportation, the relationships between transportation and geography, transportation managements and policies, and urban transportation systems. No student may earn credit for both 4753 and 5753. (Sp)

GEOG 4893 Research and Professional Development 3 Credit Hours
Prerequisite: GIS 2023; GEOG 3923 or concurrent enrollment; senior standing; departmental permission. Synthesize and integrate students' previous course experiences through literature review, professional practices and discussion to create a capstone proposal. Students complete their proposals for research to be undertaken in the subsequent capstone course, GEOG 4953. The course will include professional development e.g resume writing, presentation, and interviewing skills. (F, Sp)

GEOG 4943 Natural Hazards 3 Credit Hours
(Slashlisted with GEOG 5943) Prerequisite: junior or senior standing. Examines changes in patterns of a range of natural hazards and the impact they have on society. Examines general concepts of hazard mitigation and design and our perceptions of risk and how that affects preparedness and mitigation decisions. No student may earn credit for both 4943 and 5943. (F) [III-SS].

GEOG 4953 Capstone 3 Credit Hours
Prerequisite: Department permission and GEOG 3924, GIS 2023, and C or better in GEOG 4893. Completion of research as proposed in GEOG 4893, including a formal presentation of results to faculty and students in the department and submission of a final research report reflecting a culminating experience in the student's degree program. (Sp) [V].

GEOG 4960 Directed Readings 1-4 Credit Hours
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)

GEOG 4970 Special Topics/Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: Senior standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)

GEOG 4990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: three courses in general area to be studied; permission of instructor and department. May be repeated; maximum credit six hours. Contracted independent study for topics not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)

GEOG 5003 The Global City And Planning Issues 3 Credit Hours
(Crosslisted with RCPL 5003; Slashlisted with 4003) Prerequisite: graduate standing. An introduction to the concept of globalization and its effects on cities, and the city planning issues related to those effects. Characteristics, theories, and strategies of city development are reviewed. Cities are observed from several perspectives: natural and built environment, governance, society, economics, and history. No student may earn credit for both 4003 and 5003. (Sp)

GEOG 5023 Geography of Health and Disease 3 Credit Hours
(Slashlisted with GEOG 4023) Prerequisite: Graduate standing or permission of instructor. This course offers a holistic view on "one health" (interconnectedness of human, animal, and environmental health) by linking health and disease outcomes to the socio-cultural and physical environment that generate them. Lectures and discussion/lab sections will focus on basic concepts, principles, and methodologies in health studies, landscape epidemiology, global health under changing climate, health disparities, healthcare and medical service planning. No student may earn credit for both 4023 and 5023. (Sp)

GEOG 5033 Human Dimensions of Global Environmental Change 3 Credit Hours
(Slashlisted with GEOG 4033) Prerequisite: Graduate standing. The earth has been radically transformed by human action. This course explores the human-induced "why" and the extent of global environmental change. The need to explain, predict and prevent such change led to the development of transdisciplinary approaches examining complex human-environmental relationships. Course discusses the current, international global environmental science research agendas within the context of social and environmental justice. No student may earn credit for both 4033 and 5033. (Sp)

GEOG 5043 Urban Climatology 3 Credit Hours
(Slashlisted with GEOG 4043; Crosslisted with METR 5043) Prerequisite: Graduate standing or departmental permission. This course provides an overview of urban climates based on a synthesis of modern scientific and applied research findings. The course covers a broad spectrum of topics such as urban airflow, radiation exchanges, urban energy balance, urban heat island, urban surface hydrology, air pollution, cities under global climate change, biometeorology, and sustainable urban design and planning. No student may earn credit for both 4043 and 5043. (Sp)

GEOG 5113 Quantitative Methods in Geographic and Environmental Research 3 Credit Hours
Prerequisite: Graduate standing. An introduction to quantitative research design and problem-solving research techniques useful for geographical and other environmental and social research. (F, Sp)

GEOG 5123 Cities and Society 3 Credit Hours
(Slashlisted with GEOG 4123) Prerequisite: Graduate standing or permission of instructor. The course introduces students to the geography of cities--history of cities in human society, connections between urban policies and social outcomes, challenges in constructing a city that works for all. Key concepts include city planning, industrialization, housing, transportation, social/racial/environmental justice, gentrification, and the future of cities. No student may earn credit for both 4123 and 5123. No student may earn credit for both 4123 and 5123. (F)

GEOG 5183 Patterns and Processes in Landscape Ecology 3 Credit Hours
(Slashlisted with GEOG 4183) Prerequisite: Graduate standing. This course will identify and evaluate the central constructs and methods of landscape ecology, focusing on the role of humans in creating and affecting landscape patterns and processes. Topics covered include fundamentals/frameworks of landscape ecology; how spatial patterns influence ecosystem, management, and conservation; how to quantify spatial pattern; and how to identify general drivers of landscape pattern. No student may earn credit for both 4183 and 5183. (F)

GEOG 5200 Internship in Geography 1-3 Credit Hours
Prerequisite: graduate standing. May be repeated; maximum credit six hours. Provides career training experience for students, allowing them to apply their skills and theoretical constructs in a real world setting in industry, business, government agencies or educational institutions. (F, Sp)

GEOG 5213 Principles and Practice of Urban Planning 3 Credit Hours
(Crosslisted with RCPL 5213) Prerequisite: open to seniors in social science departments, architecture and civil engineering and to graduate students in regional and city planning. A lecture course which examines the physical, social, economic and public interest determinants of land use; the economic population and land use studies required to provide the basis for planning; space and location requirements and design characteristics for residential, commercial, industrial and public uses of land; and the study of urban traffic as a function of land use in terms of structure and systems of movement. (F, Su)

GEOG 5273 Regional Climatology 3 Credit Hours
(Slashlisted with GEOG 4273) Prerequisite: Graduate standing. Investigates the nature of the Earth's climate and provides an examination of ideas about atmospheric circulation. Topics include radiation, the hydrologic cycle, general circulation, local and regional climates, and global climate change. Specific attention is focused on the climatic water budget, its utility in evaluating local and regional climates, the role of climate models, and issues in applied climatology. No student may earn credit for both 4273 and 5273. (Irreg.)

GEOG 5283 Biogeography 3 Credit Hours
(Slashlisted with GEOG 4283) Prerequisite: Graduate Standing. Biogeography is the study of the spatial distribution, past and present, of plant and animal species and biodiversity. Course topics include factors affecting the distribution of species, the role of biogeography in biological conservation and understanding a changing world. No student may earn credit for both 4283 and 5283. (F)

GEOG 5293 Hydrologic Science 3 Credit Hours
(Slashlisted with GEOG 4293) Prerequisite: Math 1823 or 1914 and either Physics 2414, 2514 or Chemistry 1315, or the equivalents and graduate standing. Study of the processes which control the storage and movement of water at global, regional, and local scales. The emphasis is on the land portion of the hydrologic cycle, and includes the study of processes such as infiltration, soil water flow in the saturated and unsaturated zone, rainfall/runoff and evaporation. Lab sections include exercises on a computer in the field and in a soils lab. No student may earn credit for both 4293 and 5293. (Sp)

GEOG 5313 Interpreting Society and Environment: Qualitative Research Methods 3 Credit Hours
(Slashlisted with GEOG 4313) Prerequisites: graduate standing. This class approaches qualitative research methods from the perspective of human geography. That makes it especially useful for students who want to investigate the intersections of social and environmental relationships: be they historical, contemporary, or future (as in planning). No student may earn credit for both 4313 and 5313. (F)

GEOG 5343 Climate, History, and Society 3 Credit Hours
(Slashlisted with 4343) Prerequisite: graduate standing or permission of instructor. This course is an overview of the mutual interactions of climate and human activities, and examines historical examples of significant climatic impacts. The course includes investigation of the nature of earth's climate and a synthesis of contemporary scientific ideas about the climate and its environmental and societal impacts. No student may earn credit for both 4343 and 5343. (Irreg.)

GEOG 5423 Environmental Justice 3 Credit Hours
(Slashlisted with GEOG 4423) Prerequisite: graduate standing. This course will cover environmental injustices related to environmental hazards (e.g., air and water pollution, toxic and hazardous waste, industrial byproducts) as well as injustices related to environmental benefits (e.g., access to parks, greenery, and clean environments). Throughout the course, we will engage with environmental racism. No student may earn credit for both 4423 and 5423. (Sp)

GEOG 5433 Sustainability: Theory and Practice 3 Credit Hours
Prerequisites: graduate standing or permission of instructor. This course examines the concept of sustainability from a human development perspective. A set of sustainability principles are critiqued to provide an understanding of the difficulty facing human systems to solve environmental, social and economic challenges. (Sp)

GEOG 5513 Real-world Applications of Climate and Weather Information 3 Credit Hours
(Slashlisted with GEOG 4513) Prerequisite: Graduate standing. The purpose of this class is to broaden the perspective of students to the use of climate information in agriculture, energy, water resources, public health, and other areas of society. Field trip. No student may earn credit for both 4513 and 5513. (Sp)

GEOG 5523 Life Cycle Analysis 3 Credit Hours
(Slashlisted with GEOG 4523) Prerequisite: Graduate Standing. This course provides graduate students with an understanding of Life Cycle Analysis both with respect to its conceptual foundations as well as its applications across a variety of socially important sectors. No student may earn credit for both 4523 and 5523. (Sp.)

GEOG 5583 Energy Systems and Sustainability 3 Credit Hours
(Slashlisted with GEOG 4583) Prerequisite: Graduate standing or permission of instructor. An understanding of interdisciplinary elements and perspectives associated with energy systems in the context of sustainability. It examines current and future energy supply, transmission, and demand management options. A critical focus on the economic, social, and environmental implications of energy system transitions will help identify energy technology and infrastructure solutions while understanding the institutional and organizational changes necessary for implementation. No student may earn credit for both 4583 and 5583. (F)

GEOG 5653 Urban Sustainability: Nature, Justice, and the City 3 Credit Hours
(Slashlisted with GEOG 4653) Prerequisite: Graduate standing. This course explores the sustainability challenges our cities face and how we might address them from critical perspectives in urban studies, planning, and geography. Through guest speakers, films, field trips and reading discussions, we will learn about the historical, multi-spatial, political, and representational dimensions of urban sustainability, and analyze the implications of different approaches to urban sustainability. No student may earn credit for both 4653 and 5653. (F)

GEOG 5663 Water and Society 3 Credit Hours
(Slashlisted with GEOG 4663) Prerequisite: Graduate standing. To examine assumptions and understanding of the accessibility, quality, and distribution of water, the forces driving social change related to water, and the likely course of water and society issues in the future. A major objective is to challenge students to critically think about policy, and how we might develop effective, equitable, and just water policy for the 21st century. No student may earn credit for both 4663 and 5663. (F)

GEOG 5713 Dynamic Modeling of Socio-Environmental Systems 3 Credit Hours
(Slashlisted with GEOG 4713) Prerequisite: Graduate standing. This course is an overview of the use of modeling and simulation to document, analyze, and project the dynamic behavior of socio-environmental systems. The course covers an introduction of basic modeling and simulation terminology and three different approaches to modeling temporal and/or spatial dynamics: system dynamics modeling, agent-based modeling, and cellular automata. No student may earn credit for both 4713 and 5713. (Sp)

GEOG 5753 Transportation Geography and Planning 3 Credit Hours
(Slashlisted with GEOG 4753; Crosslisted with RCPL 5753) Prerequisite: Graduate standing. This course is intended to introduce students to the world of transportation planning and geography by explaining the importance of transportation from local to global and by engaging them in everyday transportation activities. Topics include, but not limited to, the history of transportation, the relationships between transportation and geography, transportation managements and policies, and urban transportation systems. No student may earn credit for both 4753 and 5753. (Sp)

GEOG 5943 Natural Hazards 3 Credit Hours
(Slashlisted with GEOG 4943) Prerequisite: graduate standing. Examines changes in patterns of a range of natural hazards and the impact they have on society. The course will examine general concepts of hazard mitigation and design and our perceptions of risk and how that affects preparedness and mitigation decisions. No student may earn credit for both 4943 and 5943. (F)

GEOG 5960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member. (F, Sp, Su)

GEOG 5970 Special Topics/Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)

GEOG 5980 Research for Master's Thesis 2-9 Credit Hours
Variable enrollment, two to nine hours; maximum credit applicable toward degree, four hours. Laboratory (F, Sp, Su)

GEOG 5990 Selected Studies in Geography 1-4 Credit Hours
1 to 4 hours. Prerequisite: teacher's certificate or bachelor's degree and permission. May be repeated with change of subject matter; maximum credit eight hours. Designed to afford either an intensive study of a systematic field or an extensive coverage of broad problem topics in geography. (F, Sp, Su)

GEOG 6220 Seminar in Human Geography 1-3 Credit Hours
1 to 3 hours. Prerequisite: twelve hours of geography or permission. May be repeated with change of subject matter; maximum credit fifteen hours. Directed studies in one of the major divisions of human geography. (Irreg.) Sec. 1 - Urban Geography Sec. 2 - Settlement Patterns Sec. 3 - Historical Geography Sec. 4 - Cultural Ecology Sec. 5 - Cultural Geography Sec. 6 - Economic Development Sec. 7 - Political Geography Sec. 8 - Social Geography Sec. 9 - Regional Geography Sec. 10 - Political Ecology .

GEOG 6230 Seminar in Economic Geography 1-3 Credit Hours
1 to 3 hours. Prerequisite: twelve hours of geography or permission. May be repeated with change of subject matter; maximum credit 15 hours. Directed studies in one of the major divisions of economic geography. (Irreg.)

GEOG 6240 Seminar in Geography and Environmental Sustainability 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing. May be repeated with change of subject matter; maximum credits 15 hours. Directed studies in one of the major aspects of geography and environmental sustainability. Possible topics include: coupled human-natural systems, energy resources, land use, sustainable development, water systems, geospatial technologies, and climate change. (Irreg.)

GEOG 6950 Research Problems in Geography 1-6 Credit Hours
1 to 6 hours. Prerequisite: graduate standing in geography, permission. May be repeated with change of subject matter; maximum credit 15 hours. Advanced independent research on any systematic or regional topic within the scope of geography appropriate to the library facilities or field study opportunities available to the student. (F, Sp, Su)

GEOG 6953 Research and Professional Development 3 Credit Hours
Prerequisite: Graduate standing and majors in the Department of Geography and Environmental Sustainability, or permission of instructor. This course provides a comprehensive background on the practice of geographic and environmental research. Students learn about current issues while exploring employment opportunities in environmental and geographical fields and practicing formal research presentations. They also formulate a research proposal, including literature review, methodology, and consideration of ethics. (Sp)

GEOG 6960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours. Directed readings and/or literature review under the direction of a faculty member. (Irreg.)

GEOG 6970 Special Topics/Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit 12 hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or research and field projects. (Irreg.)

GEOG 6973 Thinking about Geography and Environmental Sustainability 3 Credit Hours
Prerequisite: Graduate standing. This course addresses the foundational concepts of geography and environmental sustainability, emphasizing the intersection of human and natural systems. Students explore the relevance of, and possibilities for, real world impacts of geographic and environmental research. (F)

GEOG 6980 Research for Doctoral Dissertation 2-16 Credit Hours
2 to 16 hours. Prerequisite: Graduate standing and permission of instructor; may be repeated. Directed research culminating in the completion of the doctoral dissertation. (F, Sp, Su)

GEOG 6990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)

GIS 1313 Computers and Programs for Environmental Professionals 3 Credit Hours
This course covers Microsoft Office software, various computer literacy skills, Python and briefly R programming languages that will help prepare students for future environmental and GIS course work and careers. Topics include data management techniques, logical file/folder structures, Python programming tasks, safety procedures when downloading materials, geographical applications of programming, constructing "for" loops and conditional statements, and utilizing backup storage. (F)

GIS 2023 Introduction to Spatial Thinking and Computer Mapping 3 Credit Hours
Facilitates the effective communication of geographic information through sound cartographic principles and techniques. Introduces students to geographic information literacy, spatial perspectives on information management, and the use of maps as a communication tool. (Sp)

GIS 2970 Special Topics 1-3 Credit Hours
Special Topics. 1 to 3 hours. May be repeated; Maximum credit nine hours. Special topics course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research, and field projects. (Irreg.)

GIS 3003 Computer Cartography and Geovisualization 3 Credit Hours
Prerequisite: ENGL 1213/EXPO 1213 and GIS 2023. This course is designed to help students learn the theory and the practical applications of map design, with a focus on current methods for visualizing spatial data and introduces the latest cutting-edge data visualization techniques. The course covers a variety of topics but focuses on both traditional map elements but also includes modern advancements in visualization. (F, Sp)

GIS 3440 Mentored Research Experience 3 Credit Hours
0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

GIS 3960 Honors Reading 1-3 Credit Hours
1 to 3 hours. Prerequisite: Admission to Honors Program. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. The topics will cover materials not usually presented in the regular courses. (F, Sp, Su)

GIS 3970 Honors Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Subjects covered vary. Deals with concepts not usually treated in regular courses. (Irreg.)

GIS 3980 Honors Research 1-3 Credit Hours
1 to 3 hours. Prerequisite: Admission to Honors Program. May be repeated; maximum credit six hours. Will provide an opportunity for the gifted Honors candidate to work at a special project in the student's field. (F, Sp, Su)

GIS 3990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: permission of instructor and junior standing. May be repeated once with change of content. Independent study may be arranged to study a subject not available through regular course offerings. (F, Sp, Su)

GIS 4013 Fundamentals of Geographic Information Systems 3 Credit Hours
(Slashlisted with GIS 5013) Prerequisite: GIS 2023. Designed to help students learn introductory to intermediate concepts of geographic information science (GIScience) and become proficient users of geographic information systems (GIS). The course covers a variety of topics but focuses on GIS data models, data structures, and spatial analysis. Teaching formats include lectures, in-class exercises and lab exercises. No student may earn credit for both 4013 and 5013. (F, Sp)

GIS 4133 Fundamentals of Remote Sensing 3 Credit Hours
(Slashlisted with GIS 5133) Prerequisite: Junior standing or permission of instructor. An introduction to the basic principles of remote sensing, image acquisition, image processing, image interpretation, and its geographic and environmental applications. Labs involve the processing of satellite, airborne, and other geospatial data in an open-source cloud computing platform to explore the concepts taught in lectures. No student may earn credit for both 4133 and 5133. (F)

GIS 4173 Drones and Remote Sensing 3 Credit Hours
(Slashlisted with GIS 5173) Prerequisite: GIS 4133; junior standing. This course will explore remote sensing fundamentals, drone technology, data acquisition, image processing, and integration of these technologies for environmental monitoring, disaster management, agricultural applications, urban planning, and more. Students will gain the skills necessary to operate drones, process remote sensing data, and apply these tools to real-world problem solving. No student may earn credit for both 4173 and 5173. (F)

GIS 4200 Internship in Geoinformatics 1-6 Credit Hours
1 to 6 hours. Prerequisite: junior standing and permission of instructor. May be repeated; maximum credit six hours. Provides career training experience whereby students may apply geoinformatics skills and further develop professional capabilities in a realistic setting. Students will be assigned to private industry, government agencies or educational institutions on an individual basis and report on their experience to the instructor. (F, Sp, Su)

GIS 4233 Digital Image Processing 3 Credit Hours
(Slashlisted with 5233) Prerequisite: Grade of C or better in 4133 or permission of instructor. Theory and techniques for computer processing (digital image processing or DIP) of digital earth resources satellite imagery and incorporation into geographic information systems. No student may earn credit for both 4233 and 5233. (Sp)

GIS 4243 Remote Sensing Applications 3 Credit Hours
(Slashlisted with GIS 5243) Prerequisite: GIS 4133; junior standing. This course is designed to build on the Fundamentals of Remote Sensing towards helping students develop a strong understanding of the tools and techniques used to display, process, and analyze remotely sensed data. Students will learn how to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. No student may earn credit for both 4243 and 5243. (F, Sp)

GIS 4253 GIS Applications 3 Credit Hours
(Slashlisted with GIS 5253) Prerequisite: GIS 4013. Designed to help students learn intermediate and advanced concepts of geographic information science related to a variety of socio-economic and environmental fields. Course topics may include: landscape ecology and metrics; suitability modeling; binary and ranking index models; routing and network analysis; and other topics applicable to social or environmental fields. Teaching formats include both lectures and lab exercises. No student may earn credit for both 4253 and 5253. (Sp)

GIS 4453 Advanced GIS and Spatial Analysis 3 Credit Hours
(Slashlisted with GIS 5453) Prerequisite: GIS 2023 and GIS 4013 and GIS 4253, CS 1313 or CS 1323 or METR 1313 or MIS 3013, and upper-division standing; or permission of instructor. Expands and solidifies the GIS knowledge acquired in introductory and applied GIS classes. Focuses on highly complex geographic questions which cannot be solved in simple steps but instead require advanced GIS analysis and sometimes automation. The course is intended to prepare the student for a professional GIS position in the government or business world, or a higher-level graduate position. No student may earn credit for both 4453 and 5453. (Sp)

GIS 4553 Advanced Remote Sensing 3 Credit Hours
(Slashlisted with GIS 5553) Prerequisite: GIS 4133; junior standing. This course will introduce students to advanced topics in digital remote sensing towards understanding the theoretical and conceptual underpinnings in both aerial and satellite remote sensing. Focus will be placed on advanced active and passive sensors characteristics, digital image analysis, and processing for advanced issues in remote sensing, including new frontiers in the discipline. No student may earn credit for both 4553 and 5553. (F, Sp)

GIS 4653 Spatial Programming and GIS 3 Credit Hours
(Slashlisted with GIS 5653) Prerequisite: GIS 4013, upper-division standing or permission of instructor. Introduces students to geocomputation concepts, spatial programming skills and computational approaches to spatial data services and spatial problem solving. No student can earn credit for both 4653 and 5653. (F)

GIS 4733 Environmental Remote Sensing 3 Credit Hours
(Slashlisted with GIS 5733; Crosslisted with PBIO 4733) Prerequisite: either a course or hands-on experience in remote sensing, GIS, statistical analysis, computer programming, or permission of the instructor and adviser. Course develops comprehensive knowledge and advanced skills of remote sensing, to apply to the study of the structure, composition, and functions of vegetation, landscapes, and the biosphere. Students will learn hyperspectral data acquisition and analysis; field survey methods; land cover classification from multiple sensors, time series data; and estimation of biophysical and biochemical parameters. Includes image processing software and algorithms. No student may earn credit for both 4733 and 5733. (Sp)

GIS 4833 Environmental Spatial Modeling 3 Credit Hours
(Slashlisted with GIS 5833) Prerequisite: Junior standing and GIS 2023. This course covers an introduction to decision-making techniques about land use allocation and planning. Lectures and lab/discussion sections will focus on addressing conflicts involving environmental concerns and multiple objectives. Examples include water resources development, corridor location (e.g., rights-of-way for transmissions, roads, etc.), preservation of endangered species, power plant siting, and others. No student may earn credit for both 4833 and 5833. (Sp)

GIS 4923 Spatial Statistics 3 Credit Hours
(Slashlisted with GIS 5923) Prerequisite: GEOG 3924, CS 1313 or CS 1323 or METR 1313 or MIS 3013, and upper-division standing; or permission of instructor. Explains and demonstrates methods and techniques in spatial sampling; spatial auto-correlation and spatial composition. It also delves into spatially adjusted regression, local statistics, and geo-statistics and related techniques. Theoretical explanations and derivations as well as practical applications making use of both ArcGIS and R. No student may earn credit for both 4923 and 5923. (Irreg.)

GIS 4960 Directed Readings 1-4 Credit Hours
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)

GIS 4970 Special Topics/Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: Senior standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)

GIS 4990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: Senior standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)

GIS 5003 Spatial Data Management for GIS Professionals 3 Credit Hours
Prerequisite: Graduate standing. The goal of this course is to develop introductory computer science skills and information management literacy for GIS professionals finding work in industry. Students will learn how to capture, create, validate, and maintain spatial data for use in a professional GIS setting, and become familiar navigating federal, local, and private online GIS data repositories for future GIS work. (F, Sp)

GIS 5013 Fundamentals of Geographic Information Systems 3 Credit Hours
(Slashlisted with GIS 4013) Prerequisite: graduate standing. Designed to help students learn introductory to intermediate concepts of geographic information science (GIScience) and become proficient users of geographic information systems (GIS). The course covers a variety of topics but focuses on GIS data models, data structures, and spatial analysis. Teaching formats include lectures, in-class exercises and lab exercises. No student may earn credit for both 4013 and 5013. (F, Sp)

GIS 5133 Fundamentals of Remote Sensing 3 Credit Hours
(Slashlisted with GIS 4133) Prerequisite: Graduate standing or permission of instructor. An introduction to the basic principles of remote sensing, image acquisition, image processing, image interpretation, and its geographic and environmental applications. Labs involve the processing of satellite, airborne, and other geospatial data in an open-source cloud computing platform to explore the concepts taught in lectures. No student may earn credit for both 4133 and 5133. (F)

GIS 5173 Drones and Remote Sensing 3 Credit Hours
(Slashlisted with GIS 4173) Prerequisite: GIS 4133 or GIS 5133; graduate standing or permission of instructor. This course will explore remote sensing fundamentals, drone technology, data acquisition, image processing, and integration of these technologies for environmental monitoring, disaster management, agricultural applications, urban planning, and more. Students will gain the skills necessary to operate drones, process remote sensing data, and apply these tools to real-world problem solving. No student may earn credit for both 4173 and 5173. (F)

GIS 5233 Digital Image Processing 3 Credit Hours
(Slashlisted with 4233) Prerequisite: Graduate standing and a grade of C or better in GIS 4133 or GIS 5133 or permission of instructor. Theory and techniques for computer processing (digital image processing or DIP) of digital earth resources satellite imagery and incorporation into geographic information systems. No student may earn credit for both 4233 and 5233. (Sp)

GIS 5243 Remote Sensing Applications 3 Credit Hours
(Slashlisted with GIS 4243) Prerequisite: GIS 4133 or GIS 5133; graduate standing. This course is designed to build on the Fundamentals of Remote Sensing towards helping students develop a strong understanding of the tools and techniques used to display, process, and analyze remotely sensed data. Students will learn how to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. No student may earn credit for both 4243 and 5243. (F, Sp)

GIS 5253 GIS Applications 3 Credit Hours
(Slashlisted with GIS 4253) Prerequisite: graduate standing, GIS 5013. Designed to help students learn intermediate and advanced concepts of geographic information science related to a variety of socio-economic and environmental fields. Course topics may include: landscape ecology and metrics; suitability modeling; binary and ranking index models; routing and network analysis; and other topics applicable to social or environmental fields. Teaching formats include both lectures and lab exercises. No student may earn credit for both 4253 and 5253. (Sp)

GIS 5453 Advanced GIS and Spatial Analysis 3 Credit Hours
(Slashlisted with GIS 4453). Prerequisite: GIS 5013 and GIS 5253, graduate standing. Expands and solidifies the GIS knowledge acquired in introductory and applied GIS classes. Focuses on highly complex geographic questions which cannot be solved in simple steps but instead require advanced GIS analysis and sometimes automation. The course is intended to prepare the student for a professional GIS position in the government or business world, or a higher-level graduate position. No student may earn credit for both 4453 and 5453. (Sp)

GIS 5553 Advanced Remote Sensing 3 Credit Hours
(Slashlisted with GIS 4553) Prerequisite: GIS 5133; graduate standing. This course will introduce students to advanced topics in digital remote sensing towards understanding the theoretical and conceptual underpinnings in both aerial and satellite remote sensing. Focus will be placed on advanced active and passive sensors characteristics, digital image analysis, and processing for advanced issues in remote sensing, including new frontiers in the discipline. No student may earn credit for both 4553 and 5553. (F, Sp)

GIS 5653 Spatial Programming and GIS 3 Credit Hours
(Slashlisted with GIS 4653) Prerequisite: graduate standing and GIS 4013/GIS 5013. Introduces students to geocomputation concepts, spatial programming skills, and computational approaches to spatial data services and spatial problem solving. No student may earn credit for both 4653 and 5653. (F)

GIS 5733 Environmental Remote Sensing 3 Credit Hours
(Slashlisted with GIS 4733; Crosslisted with PBIO 5733) Prerequisite: graduate standing, and either a course or hands-on experience in remote sensing, GIS, statistical analysis, computer programming, or permission of the instructor and adviser. Course develops comprehensive knowledge and advanced skills of remote sensing, to apply to the study of the structure, composition, and functions of vegetation, landscapes, and the biosphere. Students will learn hyperspectral data acquisition and analysis; field survey methods; land cover classification from multiple sensors, time series data; and estimation of biophysical and biochemical parameters. Includes image processing software and algorithms. No student may earn credit for both 4733 and 5733. (Sp)

GIS 5833 Environmental Spatial Modeling 3 Credit Hours
(Slashlisted with GIS 4833) Prerequisite: Graduate standing. This course covers an introduction to decision-making techniques about land use allocation and planning. Lectures and lab/discussion sections will focus on addressing conflicts involving environmental concerns and multiple objectives. Examples include water resources development, corridor location (e.g., rights-of-way for transmissions, roads, etc.), preservation of endangered species, power plant siting, and others. No student may earn credit for both 4833 and 5833. (Sp)

GIS 5923 Spatial Statistics 3 Credit Hours
(Slashlisted with GIS 4923) Prerequisite: graduate standing; it is recommended that students have taken an introductory statistics course. Explains and demonstrates methods and techniques in spatial sampling, spatial auto-correlation, and spatial composition. It also delves into spatially-adjusted regression, local statistics, geo-statistics, and related techniques. Theoretical explanations and derivations as well as practical applications, making use of both ArcGIS and R. No student may earn credit for both 4923 and 5923. (Irreg.)

GIS 5960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member. (F, Sp, Su)

GIS 5970 Special Topics/Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)

GIS 5980 Research for Master's Thesis 2-9 Credit Hours
Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)

GIS 5990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)

GIS 6960 Directed Readings 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours Directed readings and/or literature review under the direction of a faculty member. (Irreg.)

GIS 6970 Special Topics/Seminar 1-3 Credit Hours
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit 12 hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or research and field projects. (Irreg.)

GIS 6980 Research for Doctoral Dissertation 2-16 Credit Hours
2 to 16 hours. Prerequisite: Graduate standing and permission of instructor; may be repeated. Directed research culminating in the completion of the doctoral dissertation. (F, Sp, Su)

GIS 6990 Independent Study 1-3 Credit Hours
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)

Faculty

Last Name	First/Middle Name	Middle init.	OU Service start	Title(s), date(s) appointed	Degrees Earned, Schools, Dates Completed
Bhattarai	Nishan		2022	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2022	Ph.D. Environmental Resources Engineering, State Univ of New York College of Environmental Science and Forestry, 2015; M.S. Forest Hydrology, Auburn Univ, 2010; B.S. Forestry, Tribhuvan Univ, 2006
Deng	Chengbin		2022	ASSOCIATE PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2022; DIRECTOR, CENTER FOR SPATIAL ANALYSIS, 2022	Ph.D. Geography, Univ of Wisconsin-Milwaukee, 2013; M.S. Remote Sensing and GIScience, Sun Yat-sen Univ, 2008; B.S. Remote Sensing and GIScience, Sun Yat-sen Univ, 2006
Denham	Diana		2021	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2021	Ph.D. Urban Studies, Portland State Univ; M.A. Latin American Studies, Univ of California Los Angeles; M.A. Urban Planning, Univ of California Los Angeles; B.A. Development Studies, Latin American Studies, Brown Univ
Feng	Selena		2021	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2021	Ph.D. Geography, Univ of California, Santa Barbara, 2019; M.A. Geographical Sciences and Urban Planning, Arizona State Univ, 2015; M.S. Remote Sensing & GIS, Peking Univ, 2013; B.S. Cartography and Geographical Information System, Wuhan Univ, 2010
Gliedt	Travis	J	2012	ASSOCIATE PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2018	PhD, Univ of Waterloo, 2012; MS, Univ of Waterloo, 2006; BS, Univ of Waterloo, 2005
Greene	John	S	1995	PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2008; DIRECTOR, OKLAHOMA WIND POWER INITIATIVE, 2015	PhD, Univ of Delaware, 1994; MA, Univ of Hawaii, 1990; BA, Univ of California Berkeley, 1987
Hoagland	Bruce	W	1996	HERITAGE COORDINATOR OF OKLAHOMA BIOLOGICAL SURVEY, 1999; ASSOCIATE HERITAGE ECOLOGIST OF OKLAHOMA BIOLOGICAL SURVEY, 2002; PROFESSOR OF OKLAHOMA BIOLOGICAL SURVEY, 2011; PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2011	PhD, Univ of Oklahoma, 1995; MS, Eastern Kentucky Univ, 1990; BA, Univ of Louisville, 1986
Koch	Jennifer	A M	2014	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2014	Dr.-Ing, Univ of Kassell, 2010; Diplom, Univ of Bayreuth, 2005
Loraamm	Rebecca	W	2015	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2015	PhD, Univ of South Florida, 2015; MS, Univ of South Florida, 2011; BS, Florida Southern Univ, 2009
McPherson	Renee		2012	ASSOCIATE PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2012; DIRECTOR, SOUTH CENTRAL CLIMATE ADAPTATION SCIENCE CENTER, 2012	Ph.D. Meteorology, Univ of Oklahoma, Norman, OK, 2003; M.S. Meteorology, Univ of Oklahoma, Norman, OK, 1991; B.S. Mathematics and Meteorology with Honors, Univ of Wisconsin-Madison, Madison, WI, 1987
Mullenbach	Lauren		2021	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2021	Ph.D. Recreation, Park and Tourism Management & Human Dimensions of Natural Resources and the Environment, Penn State Univ (2020), M.S. Forest Resources, Univ of Georgia (2015), B.S. Psychology, Univ of Georgia (2012)
Neeson	Thomas	M	2015	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2015	PhD, Univ of Michigan, 2010; MA, Univ of Michigan, 2009; MS, Case Western Reserve Univ, 2005; BS, Case Western Reserve Univ, 2003
Purcell	Darren	E	2009	ASSOCIATE PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2013	PhD, Florida State Univ, 2003; MA, Univ of Kentucky, 1996; BA, Univ of Kentucky, 1991

Shafer	Mark	A	1990	ASSISTANT PROFESSOR OF GEOGRAPHY AND ENVIRONMENTAL SUSTAINABILITY, 2012; RESEARCH SCIENTIST OF OKLAHOMA CLIMATOLOGICAL SURVEY, 2012; CIMMS FELLOW, 2012	PhD, Univ of Oklahoma, 2005; MS, Univ of Oklahoma, 1990; BS, Univ of Illinois, 1987
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