

# GEOGRAPHY (GEOG)

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## **GEOG 1201 Environmental Systems: Weather (4 Credits)**

First class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; introduction to the fundamentals of the environmental system and the various processes that control weather and climate. The student will have a fundamental understanding of the basic components of the environmental system, familiarity with the role of energy in the atmosphere and its control over cycles of air temperature, a sound foundation in the mechanisms governing cloud formation and precipitation, a basic understanding of the atmospheric circulation and the storm systems which develop within it, and an introduction to the regional variation of climate. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

## **GEOG 1202 Environmental Systems: Hydrology (4 Credits)**

Second class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; the role of water in the environment. This course focuses on the matter and energy flows through the hydrologic cycles, together with the resulting spatial distribution and work of water. Various environmental issues concerning water including drought, water pollution, and human impacts on water supplies are included. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1201.

## **GEOG 1203 Environmental Systems: Landforms (4 Credits)**

Third class in a three-quarter sequence that introduces the fundamental processes that govern the physical environment; geological phenomena in various places in the world. Topics include maps and air photos; rocks and minerals; plate tectonics and volcanoes; landforms produced by wind, water, earth forces and ice; and biogeography. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1201 and GEOG 1203.

## **GEOG 1216 Our Dynamic Earth I (4 Credits)**

This is the first quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. Natural processes become hazards when they have the potential to have an adverse effect on humans and their property, or the natural environment. This first quarter of the sequence introduces students to the physical processes associated with atmospheric natural hazards (tornadoes, hurricanes, severe storms) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

## **GEOG 1217 Our Dynamic Earth II (4 Credits)**

This is the second quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. In this course, students investigate the physical processes that result in geologic natural hazards (earthquakes, landslides, volcanoes) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1216.

## **GEOG 1218 Our Dynamic Earth III (4 Credits)**

This is the third quarter of a three-quarter sequence devoted to studying natural hazards and their impacts on society. In this course, students investigate the physical processes that result in hydrologic natural hazards (floods, drought, tsunamis) and their societal impacts. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1217.

## **GEOG 1264 Global Environmental Change I (4 Credits)**

First class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement.

## **GEOG 1265 Global Environmental Change II (4 Credits)**

Second class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1264.

## **GEOG 1266 Global Environmental Change III (4 Credits)**

Third class in a three-quarter sequence for honors students. This course examines the processes and drivers of global environmental change and its consequences for humans and the environment. Enrollment restricted to students in the Honors Program. A lab fee is associated with this course. This course counts toward the Scientific Inquiry: The Natural and Physical World requirement. Prerequisite: GEOG 1265.

## **GEOG 1410 People, Places & Landscapes (4 Credits)**

In this course, students will study the location of people and activities across the surface of the Earth. Describing the locations and patterns of human activity only lays the foundation for exploring how and why such patterns have developed historically, and how they relate to the natural environment and other aspects of human behavior. This course counts toward the Scientific Inquiry: Society and Culture requirement.

## **GEOG 1988 Study Abroad Resident Credit (0-18 Credits)**

## **GEOG 2000 Geographic Statistics (4 Credits)**

An introduction to statistics primarily for geography and environmental science students focusing on the scientific method, the nature of data, descriptive statistics, and analytical or inferential statistics. Enrollment restricted to Juniors and Seniors.

**GEOG 2020 Computer Cartography (4 Credits)**

Basic map design and execution using existing maps. Topics include map projections, symbolizing quantitative data, use of space, layout, compilation, verbal content, and the use of computer technology in design and production of maps.

**GEOG 2030 Field Methods (4 Credits)**

Part I, outdoor instruction in use of Brunton compass, level, plane table, and alidade; Part 2, data-gathering techniques and preparation for field work in urban problems.

**GEOG 2100 Introduction to Geographic Information Systems (GIS) (4 Credits)**

Overview of GIS, including background, development, trends, and prospects in this technological field; software package and hands-on exercises used to examine basic geographic concepts and spatial data characteristics associated with automated mapping, projections, scales, geocoding, coordinate referencing, and data structures for computerized land-based data bases.

**GEOG 2320 Andean Landscapes (4 Credits)**

This class introduces students to intensive field activities pertinent to the study of Andean individuals and societies. Students study the characteristics of people, activities, as well as landscapes across the locations of Lima, Cusco and Puno in Peru. This course focuses on geography, history, archaeology, anthropology, biology, ecology and sustainability issues surrounding the above mentioned destinations. This course involves moderate physical activity (Inca Trail hike).

**GEOG 2401 The Human Population (4 Credits)**

This course covers the fundamental concepts of demography with an emphasis on its relevance to inquiry in disciplines including economics, business, geography, environmental science, political science and sociology. This course includes computer laboratory work involving the exploration and analysis of census data using geographic information systems. This course counts toward the Scientific Inquiry: Society and Culture requirement.

**GEOG 2410 Economic Geography (4 Credits)**

Economic elements as spatially arranged, distribution of economic activities on the Earth's surface; market, resource and transportation factors in location theory.

**GEOG 2430 World Cities (4 Credits)**

The study of world cities from a geographical perspective emphasizes the following general topics: 1) worldwide urbanization and globalization processes; 2) the study of cities as nodes within global, regional, and national urban systems; 3) the internal spatial structure of land uses within cities; 4) the spatial dimensions of economic, social, political, and cultural processes in cities; and 5) environmental elements, involving human interrelationships with the natural environment in an urban setting. Urban patterns and processes are examined in each of the world's major regions, including in-depth analysis of focus case study cities.

**GEOG 2500 Sustainability & Human Society (4 Credits)**

Sustainability has become a catch phrase in discussions concerning the long-term viability of a number of phenomena, from the environment to the economy. Sustainability is commonly defined as meeting the needs of the current generation without compromising the ability of future generations to meet their needs. Students are introduced to issues inherent in discussions of sustainability. The major areas of focus include definitions of ecological and environmental sustainability, economic and political sustainability, and social justice, and various metrics used to assess sustainable behavior and practices. Students study the theory, principles and practices of sustainability, and participate in discussion and writing exercises based on lecture and readings.

**GEOG 2511 Principles of Sustainability - Honors (4 Credits)**

Principles of Sustainability introduces students to fundamental issues and concepts of Sustainability. This topic concerns the long-term viability of a number of phenomena, from the environment to the economy. Sustainability is commonly defined as meeting the needs of the current generation without compromising the ability of future generations to meet their needs. Students will be introduced to issues inherent in discussions of sustainability. The major areas of focus include definitions of ecological and environmental sustainability, economic and political sustainability, social justice, and various metrics used to assess sustainable behavior and practices. Students will study the theory, principles and practices of sustainability, and participate in discussion and writing exercises based on lecture and readings. This course counts toward the Scientific Inquiry: Society and Culture requirement. Enrollment restricted to students in the Honors Program.

**GEOG 2550 Issues in Sustainability (4 Credits)**

The capstone seminar focuses on a particular problem related to sustainability. Seminar topics vary by instructor, but include a combination of readings, discussion, guest speakers, a group project (either service learning or research), and individual research presentations. Prerequisite: GEOG 2500 and completion of all other requirements for the sustainability minor.

**GEOG 2608 Human Dimensions of Global Change (4 Credits)**

This course documents and explores the transformations of the global environment that have occurred in the last 300 years and relates them to contemporaneous changes in population and society. Students examine the complexity of human-induced environmental changes by looking at the various social, economic, political, institutional and behavioral components of these forces at work. By using various case studies, students examine the processes and spatial distributions of anthropological changes to the world's lands, freshwater, biota, oceans and atmosphere.

**GEOG 2700 Contemporary Environmental Issues (4 Credits)**

Principles, practices, issues, and status of care of environment; lectures, readings, and discussions focus on causes, effects, and mitigation of a selection of topical regional, national, and international environmental problems including Denver's air pollution, acid deposition, hazardous waste management, global warming, and tropical deforestation.

**GEOG 2701 Special Topics in Geography & Environmental Science (4 Credits)**

Special topics in geography and environmental science.

**GEOG 2730 Geography of Surfing (4 Credits)**

Surfing is often viewed simply as a recreational sport. But it is also so, so, much more. It is a multi-billion dollar global industry, a reflection of global climate patterns interacting with sedimentation regimes and the land, a globalizing culture diffusing from strong regional identities, and a reason to travel to exotic locations and explore the planet. This course uses geographic perspectives to study the many facets of the sport. Geography provides a perfect set of tools to study surfing ranging from the propagation of swells to the diffusion of culture. The goal of the course is to introduce students to the core analytical approaches used in Geography as well as for students to understand that surfing is much more than a recreational sport.

**GEOG 2750 Paleoenvironmental Field Methods (3 Credits)**

Paleoenvironmental Field Methods is a short course that focuses on the use of Quaternary paleoenvironmental research techniques, including extracting and interpreting sediment cores from wetlands and lakes to reconstruct and understand paleoclimatic events.

**GEOG 2810 Geography of Latin America (4 Credits)**

This course studies the countries and islands of Middle America; the interrelationships of peoples, resources and physical features. Cross listed with GEOG 4810.

**GEOG 2815 Geographies of Conquest: Christian, Jewish, and Islamic Societies in Andalusia (4 Credits)**

This course introduces students to the cultural landscapes, former and current, of the different societies that converged in Iberia. The class will focus on medieval Al-Andalus, the Islamic kingdoms that flourished there. During medieval times, Christian, Islamic, and Jewish societies lived side by side in an environment that oscillated between tolerance and open persecution. Science, art, scholarship, and political strategy motivated tolerance while religious fundamentalism and geopolitical considerations motivated persecution. This class will cover the human-environment interactions in the landscapes of Andalusia through an immersive field study and travel experience. This field class equals 4 academic credits. Over a period of 8 days we will visit the cities and surroundings of Madrid, Cordoba, Seville, and Granada in Spain where we will examine and compare cultural geography (past and present), history, and anthropological issues surrounding the communities that interacted in Al-Andalu.

**GEOG 2825 Biogeographies of Conservation (4 Credits)**

This course introduces students to the landscapes, biodiversity, societies, and human-environment interactions in mainland Tanzania and the island of Zanzibar through an intensive and immersive field study and travel experience. This field intensive class equals 4 academic credits. Over a period of 9 days we will visit the greater Serengeti ecosystem, Ngorongoro Crater, Olduvai Gorge, and the island of Zanzibar in Tanzania where we will examine and compare geography, cultures, history, archaeology, ecology, biodiversity, and sustainability issues. The environment in this part of East Africa offers unique challenges for wildlife and societies. By understanding the locations and patterns of human and animal activity there, students can better appreciate the circumstances affecting individuals and countries other than our own. Through observations, lectures, discussions, readings, assignments and immersion, the course will stress the development of in-situ critical thinking skills and the promotion of environmental sustainability, cultural diversity and global awareness. Fulfills biology, geography, environmental science, sustainability minor, and intercultural global studies minor requirements.

**GEOG 2830 Geography of Europe (4 Credits)**

A field course that examines relationships between humans and the environment in Europe. We study both urban and rural environments to understand the following questions: What are the elements (climate, vegetation, landforms) that characterize European natural landscapes? How have humans modified these natural landscapes? How have environmental conditions influenced human activities (e.g. agriculture, architecture, economic development)? How are these human activities manifested at the landscape scale, and how are they organized in geographic space? How have humans attempted to preserve natural landscapes? Prerequisites: GEOG 1201, GEOG 1202, GEOG 1203 and field quarter application process through the geography department.

**GEOG 2880 Geographies of South Africa (4 Credits)**

This travel course is designed to give students a first-hand look at the physical and cultural landscapes of South Africa. We will study the varied natural landscapes that produce the commodities (e.g., gold, diamonds, wine, and agriculture) that have attracted the interest of outsiders for centuries and that have influenced the cultural landscapes particular to South Africa. A systematic presentation of the geology of South Africa, and its human history, will unfold throughout our travels.

**GEOG 2988 Study Abroad Resident Credit (0-18 Credits)****GEOG 2990 Professional Development for Geography & Environmental Science (0 Credits)**

This course is designed to prepare graduating seniors for the transition to the working world or graduate study. Lectures and workshops focus on the use of LinkedIn and social media as a means of career networking, employment opportunities, professional development, and resume writing and related career services.

**GEOG 3000 Advanced Geographic Statistics (4 Credits)**

The second in a sequence of two courses that address general statistical applications particular to geography, environmental science and other disciplines dealing with a spatial dimension in the data they work with. The focus of this second course is on the more advanced multivariate statistical techniques. The course has a strong applied orientation as particular attention is given to which technique is the most appropriate to use for a given type of problem and how to interpret and apply the resulting statistics. Extensive use is made of computer statistics packages. Homework exercises involving such statistical techniques as multiple correlation and regression analysis, principle components analysis, discriminate analysis and canonical correlation. Prerequisite: GEOG 2000.

**GEOG 3010 Geographic Information Analysis (4 Credits)**

Reviews many basic statistical methods and applies them to various spatial datasets. In addition, several spatial statistical methods are applied to spatial datasets. This course is an in-depth study of the interface between GIS, spatial data, and statistical analysis. Preferred prerequisite: GEOG 2000. Prerequisite: GEOG 2100.

**GEOG 3030 Advanced Field Methods (4 Credits)**

Various field methods used by researchers in physical geography; techniques include field mapping, laboratory analyses, geologic field methods. Prerequisite: GEOG 1201 or equivalent.

**GEOG 3040 GPS for Resource Mapping (4 Credits)**

This course is an introduction to GPS (Global Positioning Systems) concepts, techniques, and applications as they relate to GIS data collection. Lectures focus on satellite surveying, GPS technology, error sources, program planning, data collection design, and Quality Control and Quality Assurance issues for data collection programs. Hands-on lab exercises include navigation, mission planning for a GPS survey, designing a field data collection plan and associated data dictionary, field data collection, differential correction, and data integration into a GIS and map production.

**GEOG 3100 Geospatial Data (4 Credits)**

This graduate-level course is designed to provide graduate students from a broad range of disciplines with the skills to carry out applied research tasks and projects requiring the integration of geographic information system technologies and geospatial data. Students are introduced to a collection of techniques and data sources with a focus on acquiring and integrating data. Legal, ethical, and institutional problems related to data acquisition for geospatial information systems are also discussed.

**GEOG 3110 GIS Modeling (4 Credits)**

This course focuses on the concepts and procedures used in discovering and applying relationships within and among maps. It extends the mapping and geo-query capabilities of GIS to map analysis and construction of spatial models. The course establishes a comprehensive framework that addresses a wide range of applications from natural resources to retail marketing. Topics include the nature of spatial data introduction to spatial statistics and surface modeling in the first five weeks followed by spatial analysis operations and modeling techniques in the second five weeks. The lectures, discussions and independent exercises provide a foundation for creative application of GIS technology in spatial reasoning and decision making.

**GEOG 3120 Environmental/GIS Modeling (4 Credits)**

Facing challenges brought by the dramatically changing global environment, environmental modeling is increasingly used to support geographical and environmental decision making (e.g., spatial conservation prioritization). Environmental modeling is concerned with the characterization, modeling and simulation of environmental phenomena and processes using conceptual and mathematical models. Environmental phenomena and processes taking place in the geographic space are regulated by spatial principles. They also interact with other phenomena or processes in the attribute space. For example, species distribution is not only constrained by spatial factors such as proximity to other species, but also influenced by environmental factors such as terrain and climatic conditions. Due to its superior capabilities of handling spatial data and modeling spatial and attribute relationships, geographic information system (GIS) provides the ideal tools for environmental modeling. This upper-level undergraduate/graduate-level course surveys the concepts and techniques of GIS supported environmental modeling in three general categories: 1) Modeling in the spatial domain where the focus is on modeling spatial principles (e.g., spatial autocorrelation); 2) Modeling in the attribute domain where the emphasis is on environmental correlations (e.g., environmental niche modeling); 3) Modeling in the combined spatial and attribute domain where both spatial principles and environmental correlations are exploited (e.g., geographically weighted regression). Throughout this course, several real-world applications are used to demonstrate the ideas, concepts, and techniques of GIS supported environmental modeling, including crime spatial pattern modeling, species distribution modeling, and soil-landscape modeling and mapping. Prerequisites: GEOG 2000 and GEOG 2100.

**GEOG 3130 GIS Programming with Python (4 Credits)**

This advanced course explores the more technical aspects of GIS functions and data structures. Students have hands-on access to both raster (grid-cell) and vector-based software packages in the form of lab exercises that culminate in a small student-designed GIS project. Prerequisite: GEOG 2100.

**GEOG 3140 GIS Database Design (4 Credits)**

Designing databases to provide a foundation for GIS functions and applications, including investigating techniques used for designing databases in non-spatial environments and learning the applicability to GIS problems. Building on concepts and techniques introduced in the first half to extend traditional techniques and methodologies to model the requirements of spatial problems. Students learn to translate the conceptual spatial model into a physical implementation specific to GIS products. Prerequisite: GEOG 2100 or GEOG 3100.

**GEOG 3160 Web GIS (4 Credits)**

With the development of internet technologies, the architecture of Geographic Information System (GIS) has evolved from the centralized desktop architecture to the distributed web architecture. Numerous web GIS applications are available (e.g., Google Map, Earth Explorer, and National Map). A web GIS application allows GIS analysts to access, manipulate, and visualize geospatial data from the web without the installation of GIS software. To facilitate the development of web GIS applications, geospatial technology vendors have provided application programming interfaces (APIs) through which GIS professionals can build customized web applications. This course focuses on the concepts and the development of web based GIS applications using industry-relevant geospatial APIs and core web technologies of HTML, CSS, and JavaScript. This is an upper-level undergraduate, to graduate-level course in GIS that introduces fundamental Web GIS concepts, applications and development kits. Concepts and techniques to be covered in this course include: • Web GIS concepts: system architecture, components, and workflow • Web programming languages: Hypertext Transfer Markup Language (HTML), Cascading Style Sheet (CSS) and JavaScript • Web mapping tools: ArcGIS online, Leaflet and their APIs. Prerequisites: GEOG 2100 and GEOG 3130.

**GEOG 3170 Geospatial Analysis Project (4 Credits)**

This course provides an opportunity for students to apply geospatial data analysis to real-world applications. Students will work as a team to develop a project that requires GIS analysis and/or application development, design a project work flow and management plan, and implement a solution. Students will demonstrate competence in GIS techniques, geospatial data analysis, and project management at a professional level. Instructor permission required.

**GEOG 3190 Lidar: Theory and Applications (4 Credits)**

Overview: Lidar (Light Detection and Ranging) is an active remote sensing system that uses laser pulses to measure the distance between the sensor and a surface or objects. Lidar has become an established method for collecting very dense and accurate elevation values, as well as for characterizing the three-dimensional structure of vegetation and urban land cover. In this course, we will build an understanding of the physical principles behind lidar, develop experience working with Lidar datasets, and survey a wide array of lidar applications for mapping and natural resource management. The course will culminate with a student-directed final project. Prerequisites: GEOG 2100 or GEOG 3200.

**GEOG 3200 Remote Sensing (4 Credits)**

This course acquaints students with the basic techniques of the collection, processing and interpretation of information about the character of the earth's surface from remote locations. Students become familiar with the use of the visible, infrared, thermal and microwave portions of the electromagnetic spectrum as a means of determining land cover and/or land use. Both manual and computer-assisted techniques are discussed and include hands-on applications.

**GEOG 3230 Advanced Remote Sensing (4 Credits)**

This course will build on the basic remote sensing concepts presented in GEOG 3200. Students will explore more in-depth concepts relevant to satellite and airborne remote sensing, including radiative transfer and information extraction. In addition, students will be introduced to two cutting-edge sources of data about the Earth's surface: hyperspectral and lidar (Light Detection and Ranging) sensors. Students will study specific applications of advanced digital image processing techniques for environmental monitoring, natural resource management, and land-use planning. Finally, students will integrate remote sensing and other spatial datasets in the context of Geographic Information System (GIS) analysis. Prerequisite: GEOG 3200.

**GEOG 3300 Cultural Geography (4 Credits)**

Themes and methods of cultural geography including cultural area, landscape, history and ecology.

**GEOG 3310 Culture/Nature/Economics-Human Ecology (4 Credits)**

Cultural adaptation, livelihood strategies and environmental modification among subsistence and peasant societies: responses of such groups to technological change and economic integration.

**GEOG 3330 Political Geography (4 Credits)****GEOG 3340 Geographies of Migration (4 Credits)**

This course explores contemporary movement of people across international borders and the social, cultural, political, economic, and environmental repercussions of such movements. The class looks at the global flow of people across national boundaries and the ways in which these dispersed peoples build and maintain social networks across national borders. While doing so, we address the role of globalization in international migration processes. What motivates people to move long distances, often across several international borders and at considerable financial and psychological cost? How do migrants change—and how in turn do they bring change, social as well as economic, to new destinations as well as places left behind? This course examines politics and patterns of migration, transnational migration, and immigration to the United States.

**GEOG 3350 Qualitative Methods in Geography (4 Credits)**

This course focuses upon qualitative methods in the production of geographic knowledge. Qualitative methods are widely employed by geographers to understand patterns and underlying processes of human and human-environment issues in society. The course is designed to expose participants to the theories, purpose, scope, and procedures of qualitative research. Specific topics include: epistemological theories (ways of knowing); ethics and power in research; research design; data collection techniques in interviewing, participant observation and landscape interpretation, discourse and archive analysis, and case studies; data analysis; and writing and disseminating qualitative findings.

**GEOG 3400 Urban Landscapes (4 Credits)**

Urbanization as a process; national urban systems; internal spatial structure of cities; role of transportation in urban development; location of residential, commercial and industrial activities; agglomeration economies; residential congregation and segregation; environmental justice; urban growth and growth coalitions; decentralization and urban sprawl; edge cities; impacts on the urban environment; world cities; globalization.

**GEOG 3410 Urban Applications in GIS (4 Credits)**

This course uses the tools of geographic information systems (GIS) to explore concepts of traditional urban geography, including defining cities/metropolis, internal urban structures, urban systems, industrial location, social and residential patterns, urban form, environmental problems, and urban planning. The course allows students to practice fundamental skills in GIS (e.g., working with attribute tables, spatial analysis, spatial queries) and cartography (map design, color theory, display of information). Depending on the quarter, students pursue individual projects of interest or client-based projects. Prerequisite: GEOG 2100 or GEOG 3100 or equivalent.

**GEOG 3420 Urban and Regional Planning (4 Credits)**

Historical evolution of planning theory and practices; comprehensive planning process; legal, political, economic, social, environmental aspects of urban planning; urban design; urban renewal and community development; transportation planning; economic development planning; growth management; environmental and energy planning; planning for metropolitan regions; national planning.



**GEOG 3425 Urban Sustainability (4 Credits)**

The 21st century is being called the 'century of the city.' Now more than ever, humans across the globe call the city their home. Many of the world's most pressing crises are manifest in cities, including: greenhouse gas emissions, land degradation, high mass production and consumption, widespread poverty and hunger, and expanding socio-economic disparities. As 'sustainability' becomes part of mainstream discourse, this course explores what sustainability means for urban contexts around the globe. Arguably, the city has the potential to be the most efficient, equitable, and environmental form of modern human settlement. Covering all dimensions of sustainability from a social science perspective, this course focuses on theoretical groundings, practices of urban sustainability, and new research agendas. Major topics include cities and nature; planning and land use; urban form; community and neighborhoods; transportation systems and accessibility; livelihood and urban economies; and social justice and the city.

**GEOG 3440 Urban Transportation Planning (4 Credits)**

A specialized course in the urban planning sequence focusing on issues, practices and policies of urban transportation planning. Recommended for anyone interested in timely transportation topics, such as the feasibility and impacts of light rail transit, the planning and implementation of highway projects, and the role of freight and passenger transportation companies in transportation planning.

**GEOG 3445 Sustainability and Transportation (4 Credits)**

Sustainable transportation aims at promoting better and healthier ways of meeting individual and community needs while reducing the social and environmental impacts of current mobility practices. Given the importance of transport for economic growth, the uncertainties surrounding the availability and price of future sources of energy for transport use, as well as the social and environmental externalities of currently-utilized transport modes, it is imperative that more sustainable ways of providing transportation be developed and utilized.

**GEOG 3450 Transportation and Mobilities (4 Credits)**

The geographical study of transport has grown considerably and become more diverse, encompassing new areas of inquiry generated from economic, urban, environmental, political, social, and cultural geography, as well as from transport geography itself. The most notable expansion has been in the area of 'mobilities' research, which is focused on the social aspects of mobility, including both the large-scale movements of people, objects, capital, and information across the world, as well as the more local processes of daily transportation, movement through public space and the travel of material things within everyday life.

**GEOG 3460 Air Transportation, High-Speed Rail and Tourism (4 Credits)**

This course delves into the world of commercial air passenger transportation, studying the foundations of the industry, its role in the travel and tourism, and strategies for the future. Foundational topics include the history and geography of air transportation, air travel and tourism, the geography of tourism, airline corporate cultures, the role of government, aviation law, regulation, deregulation, and globalization. Study of the principal elements of airline economics, finance, planning, management, operations, pricing, promotion, cost containment, marketing, and policy provide the opportunity for consideration of strategic options within the contemporary airline industry. Further discussion focuses on the planning and management of airport and airway system infrastructure, the issue of sustainable air transportation, and the role of the airline industry within the context of intermodalism. Cross listed with GEOG 4460.

**GEOG 3500 Reconstructing Quaternary Environments (4 Credits)**

Nature, magnitude, sequence and causes of Pleistocene and Holocene climatic changes; effects of climatic change on plant/animal distributions and human populations; paleoclimatic research methods. Laboratory and field trips. Prerequisites: GEOG core, ENVI 3000.

**GEOG 3510 Biogeography (4 Credits)**

Biogeography focuses on present and past distributions of plants and animals. In this course we consider a number of themes central to biogeography, including plate tectonics and biogeography, the effects of climate change of plant and animal distributions, biogeographic realms, island biogeography, biodiversity, human impacts on plants and animals, and the origins of agriculture.

**GEOG 3520 Geography of Soils (4 Credits)**

Spatial variation in soil characteristics; soil processes, soil morphology, their application in soil studies. Prerequisite: GEOG 1201-1203 Environmental Systems or instructor's permission.

**GEOG 3550 Topics in Physical Geography (1-5 Credits)**

Investigations into various aspects of physical environment.

**GEOG 3560 Fluvial Geomorphology (4 Credits)**

Examines how water and sediment interact at Earth's surface to create a variety of landforms ranging from small rills to continental-scale river systems. Introduces fundamental fluvial processes or channel hydraulics and sediment transport. Examines common fluvial landforms including alluvial streams, bedrock streams, floodplains and alluvial fans. Combines traditional lectures and in-class discussions with numerous field excursions to rivers in the Rocky Mountains and Great Plains. Prerequisite: GEOG 1203, GEOG 1218, or GEOG 1266.

**GEOG 3600 Meteorology (4 Credits)**

The basic theory and skills of weather forecasting. Topics include thorough coverage of atmosphere dynamics and thermodynamics, the evolution of various weather types, the mechanics of storm systems (cyclones, severe storms, hurricanes), creation and interpretation of weather maps, and forecasting techniques.

**GEOG 3610 Climatology (4 Credits)**

Climatology is the study of the processes that result in spatial and temporal variation of weather. This course introduces the student to the processes responsible for the transfer of matter and energy between the Earth's surface and the atmosphere and the average weather conditions that result. In addition, topics of global concern, such as greenhouse effect, El Nino, urban heat islands and acid rain, are discussed. Laboratory exercises provide an opportunity to investigate climate variation and climatic change through the use of a variety of computer simulations. Prerequisites: GEOG 1201, GEOG 1216, & GEOG 1264.

**GEOG 3620 Applied Climatology (4 Credits)**

Climatic impact on environmental systems and human behavior; techniques to investigate climatic characteristics of environmental extremes (floods, blizzards), urban climatology and socioeconomic impacts of climate. Prerequisite: GEOG 1201. Recommended Prerequisite: GEOG 3600 or GEOG 3610.

**GEOG 3630 Dendroclimatology (2-4 Credits)**

Systematic variations in tree ring width and/or density can be used to reconstruct changes in precipitation or temperature well before humans were around to record the variability. This class utilizes hands on methods to introduce the fundamental principles of dendroclimatology. Through readings and lectures, students will learn how tree ring growth can be correlated to climate change. Students will then undertake several research projects to reconstruct past climate variability in the Denver metro area using tree rings. Prerequisite: permission of instructor.

**GEOG 3640 Climate Change and Society (4 Credits)**

The science of anthropogenic climate change will be presented with an emphasis on critical evaluation of the evidence of climate change and future scenarios and migration strategies. Students will be introduced to the latest climate change research, including the Intergovernmental Panel on Climate Change report, and the most recent literature from the field. The societal and cultural implications of climate change will also be discussed. Prerequisites: GEOG 1201, GEOG 1216, or GEOG 1264.

**GEOG 3701 Topics in Geographic Information Science (1-4 Credits)**

Topics vary by instructor.

**GEOG 3720 Mountain Environments and Sustainability (4 Credits)**

Mountain Environments and Sustainability explores the unique physical and cultural aspects of high relief and/or high altitude environments. Covering one quarter of the Earth's land surface, mountains directly or indirectly impact the lives of millions of people. We examine the significance of mountains to climate, water resources, and human activities, and discuss the sustainability of these environments and communities in light of rapid changes in many mountain regions resulting from anthropogenic factors and global change. GEOG 1201, 1202, and 1203 or instructor approval.

**GEOG 3750 Topics in Human-Environment Interactions (1-4 Credits)**

This course investigates various aspects of the relationships between human societies and the natural environment.

**GEOG 3755 Geography of Health (4 Credits)**

The geography of health is a thriving area of study that considers the impact of natural, built, and social environments on human health. This course introduces students to three geographical contributions to health studies. First, it emphasizes the importance of ecological approaches to health, which consider interactions between humans and their environments, including topics such as how climate change might influence disease distributions, and how the built environment can influence patterns of physical activity. A second focus is social theory, exploring how aspects such as race, socioeconomic status, and identity play a critical role in influencing human health. A third section of the course considers how spatial methods (cartography, GIS, and spacial statistics) can help answer health-related questions.

**GEOG 3800 Geography of Colorado (4 Credits)**

This course focuses on the physical and human geography of Colorado, a state that includes the western Great Plains, the southern Rocky Mountains, and the eastern Colorado Plateau. Colorado's varied natural landscapes provide equally varied settings for human settlement and resource use. Recommended Prerequisites: GEOG 1201, GEOG 1202, and GEOG 1203.

**GEOG 3820 Kiwis and Kauris: Sustainability in New Zealand (4 Credits)**

With its tourist tagline of "100% Pure New Zealand," New Zealand prides itself as a world leader in sustainability, with great efforts made towards sustainable use of resources and renewable energy, conservation of indigenous species, and integration of indigenous Maori understandings of the land into sustainability approaches. At the same time, New Zealand faces significant sustainability challenges, particularly related to climate change, invasive species, continued reliance on extractive industries, and histories of oppression/exploitation of native peoples. This class uses a field-based case study approach to unpick some of these complex issues, as we visit local sites and explore topics such as preserving native species, sustainable resource use, ecotourism, and indigeneity.

**GEOG 3825 Geographies of International Development in Africa (4 Credits)**

What are the historical roots of (under)development in sub-Saharan Africa? How is sub-Saharan Africa typically depicted in the media? How can we explain the fact that the Niger Delta provides the bulk of Nigeria's revenue, and yet, it remains the poorest part of the country? Is climate change the major cause of persistent food insecurity in the drylands of Ethiopia and Burkina Faso? How can we make sense of the uneven geography of poverty in Ghana? What explains urban food insecurity in Cape Town, or land struggles in rural South Africa? What are the social processes underlying the spatial disparity in health status in Malawi, or gender differences in HIV rates in Nyanza province, Kenya? And why do land users often resist state conservation efforts in Tanzania? These are some of the critical questions explored in this course. The primary aim is to provide a critical introduction to the geography of sub-Saharan Africa. We will begin by exploring how "the Africa story" is told by the media, scholars and policymakers. Attention will then shift to understanding the key historical processes that shape (under)development in the region. We will cover a broad range of topics, including governance, colonial history, debt and structural adjustment, foreign aid, food and agriculture, gender, climate change, land grabbing, health, population growth, migration, remittances, and resource extraction. We cannot possibly cover all these topics in greater detail; indeed, some are too vast and complex. We will however use specific case studies to illustrate and discuss each of the topics.

**GEOG 3835 Sustainability in South Florida: The Everglades and Florida Keys (4 Credits)**

South Florida represents a unique region in the United States and faces the challenge of trying to balance a tourist economy with protection of natural landscapes and resources. The region's significant sustainability challenges include: climate change (particularly sea level rise), invasive species, fisheries management, and landscape protection. This class uses a field-based case study approach to unpick some of these complex issues as we visit local sites and explore topics such as protecting native species, sustainable resource use, and ecotourism.

**GEOG 3840 Water Resource Analysis (4 Credits)**

The focus of this course is on complex policy, economic and local, national and international, and political issues surrounding resource use in the western U.S. Issues include exploitation of nonrenewable and renewable energy and mineral resources; and flexible responses to changing public policy.

**GEOG 3860 GIS Applications and Natural Resources (4 Credits)**

In this course we will use a case study approach to examine domestic and international natural resources such as oil, coal, timber, minerals, and recycled materials. We will use a case study approach to look at resource distribution, and the environmental impacts of extraction, production, and disposal, as well as the legal and economic context. We will use GIS data and analysis to enhance our understanding of these case studies, and students will do a project and paper using GIS data and image analysis at a local, regional or global scale. Prerequisite: Introduction to GIS or Introduction to GIS Modeling.

**GEOG 3870 Water Resources & Sustainability (4 Credits)**

In this course, we look at water as both a local and global resource and examine what sustainability means for human and ecological realms. After an overview of the physical processes that drive the hydrologic cycle, surface and groundwater hydrology, we examine how we humans have harnessed water for our use and how we both alter and treat its quality. We examine the legal aspects of water allocation in the U.S. and the groups and agencies that are most involved in managing and overseeing water issues. Finally, we examine the most pressing water "issues" related to wildlife, development, scarcity and conflict. We look forward to imagining the power of both the individual and the collective in meeting our future, global water needs.

**GEOG 3890 Ecological Economics (4 Credits)**

Ecological Economics is an emerging transdisciplinary endeavor that reintegrates the natural and social sciences toward the goal of developing a united understanding of natural and human-dominated ecosystems and designing a sustainable and desirable future for humans on a materially finite planet. In this course we start with a basic overview and summary of the neo-classical economic perspective with a particular focus on the recognized market failures of public goods, common property, and externalities. We begin with a reconceptualization of economic theory by imposing scientific constraints (e.g. conservation of mass and energy, the laws of thermodynamics, evolutionary theory, etc.). Using the ideas developed in this reconceptualization of economic theory we explore the implications for international trade and myriad public policies associated with the ethical, environmental, and economic aspects of sustainability.

**GEOG 3910 Geomorphology (4 Credits)**

An advanced course that examines how Earth's landforms are created by a range of physical processes. Most landforms can be viewed as a result of some combination of erosion, transport and deposition of rock, soil and sediment. The most common agents causing these geomorphic processes are water, wind, ice and waves. This course examines the processes responsible for eroding, transporting and depositing earth materials and compares these processes with the resulting landforms. Prerequisites: GEOG 1202 or GEOG 1217 or instructor's permission.

**GEOG 3920 Remote Sensing Seminar (4 Credits)**

Special topics in advanced remote sensing.

**GEOG 3930 Cultural Geography Seminar (4 Credits)**

Topics, methods and current research in cultural geography.

**GEOG 3940 Urban Geography Seminar (4 Credits)**

International comparison of economic and social, positive and negative aspects of urban systems.

**GEOG 3950 Physical Geography Seminar (2-4 Credits)****GEOG 3955 Pollen Analysis Seminar (3 Credits)**

Pollen grains preserved in sediment provide long-term records of vegetation conditions. Changing proportions of pollen types may reflect climatic fluctuation or human impacts. We review important recent research in pollen analysis (palynology), pollen sampling, laboratory techniques and pollen identification. Students are responsible for counting a number of samples and contributing data for a pollen diagram.

**GEOG 3990 Undergraduate Research Seminar (1 Credit)**

This course is designed to prepare students who will participate in faculty-supervised summer research projects. Students are introduced to research design, use of the scientific method, research expectations and reporting of results. Preparation of formal research proposal with adviser.

**GEOG 3991 Independent Study (1-5 Credits)****GEOG 3995 Independent Research (1-5 Credits)****GEOG 3999 Geographic Internship (0-5 Credits)**

Supervised internship in a government office at local, state or federal level or within private sector. Prerequisite: permission of instructor.