DEPARTMENT OF GEOGRAPHY AND THE ENVIRONMENT

Office: Boettcher West, Room 120
Mail Code: 2050 E. Iliff Ave. Denver, CO 80208
Phone: 303-871-2513
Email: geog-info@du.edu
Web Site: http://www.du.edu/nsm/departments/geography

Geography is an academic discipline that focuses on the spatial distribution of human and physical features around the Earth and changes over time of those phenomena. Because geography bridges the boundary between the natural world and human societies, geographers often collaborate with colleagues in related disciplines in the natural and social sciences. Geographers are taught to think in spatial and chronological terms and to analyze landscapes for indications of physical and cultural features. Geographers also create maps to illustrate spatial relationships and use geographically based data sets to answer spatial questions and analyze spatial data. The field is often subdivided into physical geography, human geography, human-environment interaction and geographic information science (GISc). Our undergraduate majors are required to take introductory coursework in each of these subdisciplines, followed by more advanced courses in each of the main fields.

The central goal of the undergraduate curriculum in geography is to produce students with a solid foundation in geographic principles and perspectives, and the professional skills to put them into practice. More specifically, the program aims to provide students with skills and techniques that will allow them to apply what they learn in the classroom, laboratory and field. Students are provided with skills in problem identification and solution; training in geotechnical tools, including geographic information systems, cartography, remote sensing, geographic statistics and spatial analysis; and experience in field and laboratory techniques. The discipline of geography is, by nature, integrative and broadly based, so interdisciplinary approaches to problem solving are also emphasized. Our ultimate goal is to provide graduates with training and preparation for employment as professional geographers in government, private industry, education and nongovernmental agencies, and to prepare students for graduate school.

The environmental science program is an interdisciplinary program with the mission of preparing students with the knowledge and skills to identify, analyze and resolve environmental issues. Atmospheric pollution, water supply and quality, global climate change, waste management, species extinction—these are just a few of the better-known issues encompassed by environmental science, a field that addresses the totality of relationships between humans and the natural environment. Through a combination of small lecture, lab and field-oriented courses, students are given hands-on experience with environmental questions and problem solving. Extended field experiences, including alpine ecology at our field station at Mount Evans, are integrated into courses. Students also have the opportunity to participate in the field quarter, spending 10 weeks traveling throughout the western United States, Baja Mexico and other international destinations to study environmental problems and issues.

Geography

Bachelor of Arts Major Requirements

(183 credits required for the degree [http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts])

Students majoring in geography may not also major in environmental science.

45 credits of geography. Requirements include the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 1410</td>
<td>People, Places &amp; Landscapes</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 2000</td>
<td>Geographic Statistics</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 2020</td>
<td>Computer Cartography</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 2100</td>
<td>Introduction to Geographic Information Systems (GIS)</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 2990</td>
<td>Professional Development for Geography &amp; Environmental Science</td>
<td>0</td>
</tr>
<tr>
<td>Select one of the following sequences:</td>
<td></td>
<td>12</td>
</tr>
</tbody>
</table>

| GEOG 1216 | Our Dynamic Earth I & Our Dynamic Earth II & Our Dynamic Earth III | | |
| GEOG 1264 | Global Environmental Change I & Global Environmental Change II & Global Environmental Change III | | |

Upper-division credits (2000- or 3000-level courses); at least one physical geography, one human geography and one GIScience course

Total Credits

45
Must be completed during senior year.

GEOG 1264, 1265, 1266 are for Honors Program students only.

A list of acceptable courses is available from the Department of Geography and the Environment.

The student may choose one of the following tracks of emphasis:

- natural resource management
- atmosphere and climate
- cultural and regional geography
- earth processes
- geographic analyses
- land use or urban planning

Students preparing for entrance to graduate school or intending to use geography professionally should consult regularly with their departmental advisors.

**Minor Requirements**

20 credits of geography at the 2000- or 3000-level.

**Geographic Information Science**

**Minor Requirements**

20 credits of coursework. Requirements include the following:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 2100</td>
<td>Introduction to Geographic Information Systems (GIS)</td>
<td></td>
</tr>
<tr>
<td>GEOG 3200</td>
<td>Remote Sensing</td>
<td></td>
</tr>
</tbody>
</table>

A list of acceptable elective courses is available from the geography department.

Note: As geography majors may emphasize GISc as part of their degree program, they are not eligible to complete the minor in GISc.

Prerequisites: Students are expected to have completed the Analytical Inquiry-Natural Science requirement or equivalent prior to enrolling in GEOG 2000 Geographic Statistics. Completion of an introductory course in geography such as GEOG 1410 People, Places & Landscapes; GEOG 1201 Environmental Systems: Weather; or GEOG 1216 Our Dynamic Earth I is encouraged but not required.

**Geology**

A minor in geology may be arranged by consultation with the faculty of the Department of Geography and the Environment.

**Minor Requirements**

Minimum of 20 credits of geology.

**Environmental Science**

**Bachelor of Arts Major Requirements**

(183 credits required for the degree [http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofarts])

Students majoring in environmental science may not also major in geography.

75 credits. Requirements include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 1201</td>
<td>Environmental Systems: Weather</td>
<td>12</td>
</tr>
<tr>
<td>&amp; GEOG 1202</td>
<td>and Environmental Systems: Hydrology</td>
<td></td>
</tr>
<tr>
<td>&amp; GEOG 1203</td>
<td>and Environmental Systems: Landforms</td>
<td></td>
</tr>
<tr>
<td>BIOL 1011</td>
<td>Evolution, Heredity and Biodiversity</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIOL 1021</td>
<td>and Evolution, Heredity and Biodiversity Lab</td>
<td></td>
</tr>
</tbody>
</table>
### Bachelor of Science Major Requirements

(183 credits required for the degree [http://bulletin.du.edu/undergraduate/undergraduateprograms/traditionalbachelorsprogram/bachelorofscience])

Students majoring in environmental science may not also major in geography.

94 credits. Requirements include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 1201</td>
<td>Environmental Systems: Weather and Environmental Systems: Hydrology</td>
<td>12</td>
</tr>
<tr>
<td>&amp; GEOG 1202</td>
<td>and Environmental Systems: Landforms</td>
<td></td>
</tr>
<tr>
<td>&amp; GEOG 1203</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 1010</td>
<td>Physiological Systems and Physiological Systems Lab</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIOL 1020</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 1011</td>
<td>Evolution, Heredity and Biodiversity and Evolution, Heredity and Biodiversity Lab</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIOL 1021</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 2010</td>
<td>General Ecology and General Ecology Lab</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIOL 2011</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 1010</td>
<td>General Chemistry I and General Chemistry I Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 1240</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 1020</td>
<td>General Chemistry II and General Chemistry II Laboratory</td>
<td>4</td>
</tr>
<tr>
<td>&amp; CHEM 1250</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 2240</td>
<td>Introduction to Environmental Chemistry</td>
<td>4</td>
</tr>
<tr>
<td>ENVI 3000</td>
<td>Environmental Law</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 2700</td>
<td>Contemporary Environmental Issues</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 1111</td>
<td>General Physics I</td>
<td>15</td>
</tr>
<tr>
<td>&amp; PHYS 1112</td>
<td>and General Physics II</td>
<td></td>
</tr>
<tr>
<td>&amp; PHYS 1113</td>
<td>and General Physics III</td>
<td></td>
</tr>
</tbody>
</table>

1 Must be completed during senior year.

2 A list of acceptable courses is available from the Department of Geography and the Environment.

### Additional Requirements

20 credits in a minor field of study

No more than five credits taken as independent study, internship or independent research may be counted toward the minimum hours required in the major.
GEOG 2990 Professional Development for Geography & Environmental Science 0

Select one of the following: 4

BIOL 2090  Biostatistics
GEOG 2000  Geographic Statistics
PSYC 2300  Introduction to Statistics

Environmental Science Electives 8

Biology 8
Geography/Geology/Envi 8
Additional Electives 12

Total Credits 94

1 Must be completed during senior year.
2 A list of acceptable courses is available from the Department of Geography and the Environment.

Additional Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Calculus</td>
<td></td>
</tr>
<tr>
<td>MATH 1951</td>
<td>Calculus I</td>
<td>4</td>
</tr>
<tr>
<td>MATH 1952</td>
<td>Calculus II</td>
<td>4</td>
</tr>
<tr>
<td>or MATH 1962</td>
<td>Honors Calculus II</td>
<td></td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>8</td>
</tr>
</tbody>
</table>

No more than five credits taken as independent study, internship or independent research may be counted toward the minimum hours required in the major.

Minor Requirements

26 credits. Requirements include:

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GEOG 1201</td>
<td>Environmental Systems: Weather</td>
<td>12</td>
</tr>
<tr>
<td>&amp; GEOG 1202</td>
<td>and Environmental Systems: Hydrology</td>
<td></td>
</tr>
<tr>
<td>&amp; GEOG 1203</td>
<td>and Environmental Systems: Landforms</td>
<td></td>
</tr>
<tr>
<td>BIOL 1011</td>
<td>Evolution, Heredity and Biodiversity</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIOL 1021</td>
<td>and Evolution, Heredity and Biodiversity Lab</td>
<td></td>
</tr>
<tr>
<td>BIOL 2010</td>
<td>General Ecology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BIOL 2011</td>
<td>and General Ecology Lab</td>
<td></td>
</tr>
<tr>
<td>GEOG 2700</td>
<td>Contemporary Environmental Issues</td>
<td>4</td>
</tr>
<tr>
<td>Total Credits</td>
<td></td>
<td>26</td>
</tr>
</tbody>
</table>

Students having completed the required courses as part of other degree program requirements complete the 26-credit requirement by taking courses from the approved list of courses available from the Department of Geography and the Environment.

Requirements for Distinction in the Major in Geography

• Minimum 3.4 cumulative GPA
• Minimum 3.6 major GPA
• Completion of a thesis

Requirements for Distinction in the Major in Environmental Science

• Minimum 3.4 cumulative GPA
• Minimum 3.6 major GPA
• Completion of a thesis

Bachelor of Arts in Geography

This course sequence is recommended, but not required.
First Year
Fall     Credits     Winter     Credits     Spring     Credits
GEOG 1201 4 GEOG 1202 4 GEOG 1203 4
GEOG 1410 4 GEOG 1410 4 GEOG 1410 4
FSEM 1111 4

Total Credits: 28

1 GEOG 1410 is offered Fall, Winter, and Spring quarters and only needs to be taken once. It is recommended that you complete GEOG 1410 by the end of your first year.

Bachelor of Science in Environmental Science

Environmental Science Courses

ENVI 2660 Environmental History of Sonora & Baja Mexico (5 Credits)
Geography and ecology of desert southwest emphasizing Mexican states of Sonora, Baja California del Sur and Baja California. Traveling by van and lodging in tents, trip covers 3,500 miles, offers hands-on experience with principles and problems of physical geography and ecology in desert environments. Offered only during Interterm.

ENVI 2801 Water Quality of Western Rivers and Streams (2,4 Credits)
This course covers the physical, chemical, and biological aspects of water quality of Colorado rivers and streams. Impacts from human activities, including mining and agriculture are evaluated. Significant time is spent assessing the water quality of surface and ground waters by completing a course-long project that evaluates the water quality of three surface rivers/streams near the University of Denver: Sand Creek, Clear Creek, and the headwaters of the Arkansas River. The course is an integrate lab/lecture course with significant time spent in the field collecting data. Prerequisite: GEOG 1203 or CHEM 1010.

ENVI 2950 Topics in Env. Science (1-4 Credits)
An in-depth coverage of a specific environmental issue, topic, or problem. Topics vary with instructor.

ENVI 2992 Directed Study (1-10 Credits)

ENVI 3000 Environmental Law (4 Credits)
Purpose and applications of federal laws pertaining to environmental protection, including NEPA, RCRA, CERCLA, and Clean Water and Clean Air Acts; addresses role of states in implementation of federal environmental laws.

ENVI 3550 Environmental Issues-Colorado (4 Credits)
This course focuses on the identification, analysis and mitigation of landscape-scale environmental issues or concerns, using watersheds as units of study. Emphasis is on field data collection and analysis to answer specific questions or address particular problems.

ENVI 3991 Independent Study (1-5 Credits)
Study of a topic not covered in existing course offerings. May be used for work completed in off-campus internships that focus primarily on the mastery of existing knowledge.

ENVI 3992 Directed Study (1-10 Credits)

ENVI 3995 Undergraduate Research (1-5 Credits)
Original research in environmental science topic under sponsorship of a faculty member; applicable to studies that focus primarily on discovery of new knowledge through application of scientific method.

ENVI 3999 Environmental Science Internship (1-5 Credits)
Supervised internship in a state, local, or federal office or in the private sector. Prerequisites: 15 quarter hours in the environmental science major and approval of supervising faculty. Maximum of 5 quarter hours total.
**Geography Courses**

**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. Prerequisite: GEOG 1217.

**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 1992 Directed Study (1-10 Credits)**

**GEOG 2000 Geographic Statistics (0-4 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.
GEOG 2010 Digital Earth (4 Credits)
Paper maps will always with us but clearly society has turned to a "digital earth" to enhance our spatial awareness. Digital date are available in many formats and via countless applications for locating, sharing, and analyzing geographic data about the world around us. In this class we will explore the fundamentals of geospatial technology, including Geographic Information Systems (GIS), Global positioning systems (GPS), remote sensing, and spatial analysis through a series of computer exercises. Students will learn how to use geospatial technology to address social and environmental issues. This course is a survey of geospatial technology but can be used as an entry-level course into a geospatial program.

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. Cross listed with GEOG 3100.

GEOG 2100 The Political Ecology of Natural Resources in Guatemala (4 Credits)
This class, through the lens of political ecology and action-oriented research, introduces students to the extremes of Guatemala and how one of the most unequal societies in the West has evolved over the past 500 years. With a firm understanding of Guatemala's social reality we then conduct initial community-based research with several communities in the highlands and lowland return refugee frontier communities with the goal of identifying the best options for sourcing and then providing potable water and/or other vital resources. The class also introduces students to field methods in cultural geography and then how to apply them in field in international settings.

GEOG 2120 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 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 2420 Geography of Tourism (4 Credits)
Major cultural and environmental motivations for tourism; major tourism flow patterns; and predominant domestic and international touristic regions.

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. This course counts toward the Scientific Inquiry: Society and Culture requirement.

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)
Geog 2511 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.
GEOG 2550 Issues in Sustainabilities (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 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 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 2860 Geography of the Middle East (4 Credits)
In-depth study of the physical and human geography of the Middle East. Upon completion of this course, students will be able to think and speak effectively about the Middle East, particularly about relationships between villagers, nomads and city folk; about the history of the region; about management of environmental problems such as desertification and water shortages; about the civilization of Islam, about culture and the role of all religions; about the reasons for war, the need for peace, and the role of terrorism; about oil and more importantly, the oil curse, and finally about the role of US foreign policy.

GEOG 2870 Geography of India (4 Credits)
This course will provide students with a comprehensive idea about India, which is considered as a major emerging power of this century. India is extremely diverse in terms of physical features and cultural practices. It has a very dynamic economic and political system. The long history of the land and its rich cultural heritage has made its lifestyle very different from the people outside the subcontinent. This course deals with all the above issues in brief and helps the students to gain an overall knowledge of the subcontinent. This is a good foundation course for those who participate in the study abroad program in India and also others who are interested in this region of the world.

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 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 2992 Directed Study (1-10 Credits)

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 projects 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. Cross listed with GEOG 2100.

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 3130 Advanced Geographic Information Systems (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 3150 GIS Project Management (4 Credits)
This course provides graduate students seeking a career in GIS, or anyone managing a GIS project, with the knowledge, skill and abilities to take a GIS project or program past the design and implementation phase and into day-to-day operation. Students evaluate and analyze the role of GIS in an organization's overall information system strategy and communicate the importance of geography in an information system. Data sharing in the organization is examined to determine the benefits and costs of distributing data creation and maintenance activities throughout an organization. Finally, the role of GIS professionals and the skill sets required to manage GIS effectively are examined. Students review case studies of successful and not-so-successful GIS projects in North America. GIS management issues are addressed by a series of case studies focusing on various management aspects. Students are also expected to visit operational GIS programs in the metropolitan area and interview GIS managers. Students prepare case study evaluations for review in the classroom. Required for all MSGIS students because of the critical importance of GIS project management.

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 3300 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 & 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.

GEOG 3470 GIS & Environmental Health Geography (4 Credits)
This course is designed to acquaint students with the spatial distributions of populations and their relationships to environmental pollution sources and health outcomes. It utilizes real-life scenarios using population data from the U.S. census, EPA pollution data and various types of vital statistics data. The goal is to implement novel geographic techniques such as spatial analytical techniques and atmospheric modeling of pollutants to assess possible health risks and outcomes. This class requires basic GIS knowledge.

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 1201-1203 Environmental Systems or instructor's permission.

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 on 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 atmospheric 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.

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 3700 Environment & Development (4 Credits)
Course examines interrelated nature of environmental and development issues in the Third World; addresses the place of environment in development theory and practice and the political ecology of Third World environmental problems and sustainable development approaches.

GEOG 3701 Topics in Geographic Information Science (1-4 Credits)
Topics vary by instructor.
GEOG 3710 Environmental Change in the Eastern Mediterranean (2 Credits)
We tend to associate environmental problems with modern societies and high technology. However, humans have had impacts on the environment, and have had to cope with challenges brought by the environment, throughout their history. Western cultures are intimately linked to the eastern Mediterranean, where some of the earliest centralized governments arose, agriculture developed, and humans first began living in permanent settlements, so the region has a long history of human-environment interaction. This class focuses on historical, archaeological, and paleoenvironmental records from the region to investigate the impacts of human activities, including deforestation, intensive agriculture, and urban development, on the environment, and the ways in which societies in the region responded to natural environmental perturbations, including drought, earthquakes, and volcanic eruptions.

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 3730 International Environmental Policy (4 Credits)
This course acquaints students with the global perspective on current problems of environmental protection and resource use. Population growth, food production, industrialization, technology and cultural change are considered, with heavy emphasis on the social dynamics of environmental problems. A variety of political views are studied, and an attempt is made to develop a perspective useful to students in personal and political decisions.

GEOG 3734 Environmental Justice in the City (4 Credits)
This course is designed to acquaint students with environmental justice in the urban environment. This class focuses on the City of Denver as a laboratory to explore the disproportionate impacts of social justice issues, particularly urban pollution, healthy food sources, gentrification, light rail, and employment opportunities, on neighborhoods and communities. A variety of views are studied, and an attempt is made to develop a perspective useful to students to explain urban social justice conditions.

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 3760 Health & Environment, England (4 Credits)
This field course meets in England, visiting several sites in the Midlands. It focuses on ecological approaches to health, which emphasize the relationship between humans and their environment as a critical influence on the health status of populations. This environmental influence may come from the natural, built, or social environment. The course will use a case study approach to emphasize i) the importance of the natural, built, and social environment to human health, and ii) how the relationship between humans and their environments and its sustainability has changed over time. We will explore eight different time periods, asking in each case how people's relationships with their natural, built, and social environments have influenced health at the population scale, and how these influences can inform sustainable health and environment in the future.

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 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 3830 Natural Resource Analysis & Planning (4 Credits)
Natural resources provide the basis for all human agricultural and industrial activities. This course discusses our resource distribution, conservation, management and sustainable use.
**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 3880 Cleantech and Sustainability (4 Credits)**
Cleantech has only recently become part of our vernacular and it refers to the technology that enables us to produce energy in a manner that has little or no environmental impact (solar, geothermal, wind, responsible biofuels). Clean technology will not only offer us a chance to rehabilitate the climate, but should make us more aware of how fundamental our approach to everyday life needs a more sustainable consciousness. As part of the debate, we will examine some of the problems facing civilization, why we are not sustainable, who the major players are, and how a more sustainable existence is not just our moral obligation, but it is also good economics and sound foreign policy that will accelerate poverty alleviation.

**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 3992 Directed Study (1-10 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.
Geology Courses

**GEOL 1010 Physical Geology (4 Credits)**
Physical geology examines the internal structure of the Earth, the nature and properties of Earth materials, their distribution through the Earth, and the processes by which rocks are formed, altered, and transported. This course serves as an introduction to the geological sciences and is a prerequisite to advanced study.

**GEOL 1992 Directed Study (1-10 Credits)**

**GEOL 2020 Historical Geology (4 Credits)**
Historical geology is the study of the evolution of Earth through geologic time. Geologic features such as rock types and fossils are used to interpret and date past events. This course specifically introduces the basic geologic principles underlying historical geology, the geologic evolution of North America, and the evolution of life on Earth.

**GEOL 2380 Rocks and Minerals (4 Credits)**
This course focuses on the identification, classification, and formation of common rock types and rock-forming minerals. Students will learn to reconstruct geologic conditions and earth history from rock and mineral features. Prerequisite: GEOL 1010, GEOG 1203 or permission of instructor.

**GEOL 2400 Geology and Ecology of the Southwest (5 Credits)**
This field class emphasizes firsthand observations of the interactions among environmental properties (including substrate geology, soils, and climate) and natural vegetation in the Colorado Front Range, Rio Grande Rift, and Chihuahuan desert regions of New Mexico and southeastern Arizona. The course also examines Pliocene and Quaternary volcanism in southern Colorado and New Mexico in addition to Paleozoic and Mesozoic geology along the uplands of the Rio Grande Rift. Prerequisite: permission of instructor.

**GEOL 2800 Geology of National Parks (4 Credits)**
The geology and landforms of the United States are not better illustrated than in our national parks. This course presents the physical and geological processes that have shaped many of our national parks. Focus of the course will include Yosemite, Grand Canyon, Rocky Mountain, Yellowstone, Grand Teton, Zion, and Bryce National Parks as well as selected others. Prerequisites: one of the following: GEOG 1203, GEOG 1217, GEOL 1010, an introductory course in geology, or instructor’s permission.

**GEOL 2992 Directed Study (1-10 Credits)**

**GEOL 3010 Process Geomorphology (4 Credits)**
The land surface of Earth is continuously altered by geomorphic processes. This class focuses upon the nature of these processes, the work that they perform and the resulting landforms. In addition, the student becomes familiar with various methods of geomorphic analysis through the laboratory component of the class. Cross listed with GEOG 3910. Prerequisite: GEOL 1010, GEOG 1203 or permission of instructor.

**GEOL 3100 Environmental Geology (4 Credits)**
Environmental geology examines geologic hazards, both natural and those attributable to human impacts on the environment from urban and regional development. Specific topics may include disposal of municipal solid waste and radioactive waste; flood, earthquake, volcanic hazards; groundwater pollution and withdrawal; mass-wasting phenomena; and energy-related issues. Prerequisite: GEOL 1010, GEOG 1203 or instructor’s permission.

**GEOL 3200 Sedimentology/Stratigraphy (4 Credits)**
This course reviews the origin, geologic history, and depositional environments of sediments and sedimentary rocks. Course work concentrates on the identification of sedimentary rocks and depositional environments by first-hand observations of rocks in the Denver area. Prerequisite: GEOL 1010, GEOG 1203 or instructor’s permission.

**GEOL 3300 Petroleum Geology (4 Credits)**
This class examines the geological occurrences of petroleum including the origin, migration, and accumulation of oil and natural gas. This class differs from traditional petroleum geology classes by offering an examination of the economics and politics underlying the oil and gas industry, and by considering alternatives to traditional hydrocarbon resources. Prerequisite: GEOL 1010, GEOG 1203 or instructor’s permission.

**GEOL 3520 Erosion Process & Measurement (4 Credits)**
Soil erosion is arguably the most serious environmental problem worldwide. This course focuses upon the significance of this problem, the factors affecting erosion rates, the nature of the processes themselves, methods of measurement, estimation of erosion rates and erosion control practices. Prerequisites: GEOG 1203, GEOG 1218, or GEOG 1266.

**GEOL 3540 Hydrology (4 Credits)**
This course provides an overview of the hydrologic cycle with emphasis placed on the study of applied hydrology. Discussions include the fundamental characteristics of precipitation, runoff processes, calculation of flood hazards, aquifers (porosity and permeability), the geologic settings of groundwater, the basic physics of groundwater flow, and water supply and use. Prerequisite: GEOL 1010, GEOG 1203 or instructor’s permission. Recommended prerequisite: one introductory statistics course.

**GEOL 3900 Geomorphology Seminar (1-5 Credits)**
Hill slopes comprise the vast majority of the Earth’s land surface. It is upon these surfaces that nearly all of the human population must exist and, hopefully, flourish. Hill slopes assume various forms, and their shape influences their utility for various human endeavors. Numerous geomorphic processes operate upon hill slopes to determine their form, and human activities strongly influence the frequency and magnitude of these geomorphic processes. Consequently, hill slopes are an interface between the Earth and the human population. Prerequisite: GEOL 3010 or permission of instructor.
GEOL 3991 Independent Study (1-5 Credits)
GEOL 3992 Directed Study (1-10 Credits)