



GEOGRAPHY AND THE ENVIRONMENT 2013-2014

Why study geography at the University of Denver?

Consider these advantages:

- Engaged and research-active faculty
- Small classes and personal attention
- State-of-the-art geospatial technology laboratories
- Strong and exciting field orientation
- Excellent location for applied research in physical and human geography

Situated at the foot of the Rocky Mountains in the dynamic city of Denver, the University of Denver is an ideal laboratory for physical and human geographers, as well as those studying human-environment interaction and geographic information science.

Since it was founded in 1945, the University of Denver's department of geography has offered excellent opportunities for graduate students in teaching, research, academia, government and the private sector.

Quite simply, we are state-of-the-art. Among our distinctive assets:

- Fully networked labs with frequent upgrades in hardware, specialized equipment and software
- Four Geographic Information Systems (GIS) labs which include most industry standard GIS software (All ESRI products, ERDAS Imagine, E-cognition, ENVI, Web Mapping and Geo-visualization products)
- USDA-approved soil and sediment lab, a weather and climate lab and the Hoyt Mineral Collection
- Multimedia teaching classrooms
- National and international field trips
- The Mount Evans field station (elevation 10,600 feet), is just 45 minutes from campus. Come visit our facilities, meet our faculty and students and see the advantages for yourself.

The Department of Geography and the Environment at the University of Denver offers programs leading to the MA, MS in Geographic Information Science (GISc) (on-campus and online programs) and PhD. Areas of teaching and research include biogeography, climatology, computer-assisted cartography, cultural ecology, cultural geography, development, ecological economics, economic geography, environmental geology, geographic information science, geovisualization, geomorphology, global change, hydrology, land use/land cover analysis, Latin America, natural resources, paleoenvironmental change, political ecology, population geography, Quaternary studies, remote sensing, soils, spatial analysis, sustainability, transportation, and urban geography and planning. With ten tenure-line faculty and four full-time lecturers, our faculty is very active in research, publishing numerous journal articles and presenting many conference papers every year. Our faculty members also are known for their excellence as instructors, with several faculty having earned major teaching awards.

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UNIVERSITY of
DENVER

Geography and the Environment

Boettcher Center West, Room 120

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Denver, CO 80208

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<http://www.geography.du.edu>

DEGREE REQUIREMENTS

Master of Arts in Geography

Students are presumed to possess a geographic background equivalent to what is required for an undergraduate major in geography.

Credit Hour Requirements

For the MA degree, 45 quarter hours of course work and an acceptable thesis are required. Students can specialize in subfields within physical geography, human geography or human- environment interaction.

Research Proposal Presentation

Each student is required to prepare and present a thesis proposal and have it formally approved by the student's faculty committee.

Final Oral Defense

Upon completion of required course work, proposal approval and the thesis, each student will undergo a final oral defense. This exam is usually about two hours in length. The exam will address both course work and the thesis research. The final oral examination is to be conducted at least three weeks before the end of the quarter in which the degree is to be awarded. The examining committee consists of no fewer than three members chosen from the faculty of the department, although one member can be from a related cognate discipline outside the department. There is also an outside chairperson who must be a tenured faculty member from another department at the University of Denver serving as the university representative.

Thesis Requirement

Original research of a geographic topic is required, the scope of which is determined by the thesis committee. The thesis should be of publishable quality.

Course Requirements:

A minimum of 33 quarter hours in geography is required, including:

- GEOG 3000 Advanced Geographic Statistics
- GEOG 4000 Fundamental Geographic Perspectives
- GEOG 4020 Geographic Research Methodology
- GEOG 4040 Research Identification
- GEOG 4900 Geography Colloquium

Students must also complete at least four credit hours in each of the following concentrations: human, physical, and geographic information science courses.

Doctor of Philosophy in Geography

The student is presumed to possess an appropriate background in geography, approximately equivalent to the MA core program.

Credit Hour Requirements

A minimum of 117 quarter hours of credit is required for the doctoral degree, 45 hours of which may be awarded from the student's MA or MS program, and must include the equivalent of GEOG 3000, GEOG 4000, GEOG 4020, GEOG 4040 and GEOG 4900.

Examinations

PhD Research Proposal Presentation

Each student is required to prepare and present a dissertation proposal and have it formally approved by the student's faculty committee. This should be completed by the end of the second year for a full-time PhD student.

Comprehensive Exam

This exam, which includes both written and oral parts, is designed to evaluate the student's work at the University of Denver.

This exam is usually scheduled after all substantive course work has been completed and the dissertation proposal has been approved. It must be taken at least three quarters prior to expected graduation. Students should consult with their adviser and committee members to achieve a greater understanding of what will be on the exam. The written portion of the exam can be taken in one of two formats: a written examination conducted in the department usually taken over two days, lasting four hours each day, or a take-home examination in which the student has five days to complete the exam. An oral examination is held two weeks after the written exam has been completed. A candidate who fails one or all parts of the comprehensive exam may petition the department for re-examination. Re-examination, if granted by the department, may not be scheduled until the succeeding quarter and cannot be retaken more than once.

Oral Defense

Upon completion of course work, approved proposal, comprehensive exam and the dissertation, each student will undergo a final oral defense. An oral defense may not be scheduled until at least the second quarter following the quarter in which the comprehensive exam was successfully completed (the summer may count as a quarter, though no examinations should be scheduled during the summer). The final oral defense is to be conducted at least two weeks before the end of the quarter in which the degree is to be awarded. This defense is usually about two hours in length, and is composed of a 20–25 minute presentation by the student followed by questions from the committee. The examining committee consists of no fewer than four members chosen from the faculty of the department, related cognate disciplines, or outside the university. There is also a nonvoting outside member of the examining committee who serves as the chair for the final examination and must be a tenured or tenure-track faculty member at the University of Denver serving as the university's representative.

Course Requirements:

Required courses:

GEOG 3000 Advanced Geographic Statistics
 GEOG 4000 Fundamental Geographic Perspectives
 GEOG 4020 Geographic Research Methodology
 GEOG 4040 Research Identification
 GEOG 4900 Geography Colloquium

Doctoral program requirements include a course curriculum consisting of at least 32 additional quarter hours of geography courses directed toward the dissertation research; cognitive course work in a related field of at least 12 quarter hours; at least two graduate seminars; demonstrated competency in two research tools; approval of dissertation proposal; and completion of an acceptable dissertation.

The options to meet the tool requirement include languages, geographic information systems, computer cartography, remote sensing and geographic statistics. A comprehensive examination is given after completion of course work and proposal presentation, and an oral defense of the dissertation is required for completion of the degree.

For doctoral programs, research areas are limited to the fields of biogeography, climatology, cultural geography, economic geography, geographic information science, geomorphology, global change, human environment interaction, Latin America, paleoenvironmental change, population, Quaternary studies, transportation geography and urban geography in accordance with current faculty expertise.

Master of Science in Geographic Information Science

Students are assumed to possess a basic knowledge of cartography, geographic information systems and statistics. These prerequisites can be completed by taking the equivalent of GEOG 2000, GEOG 2020 and GEOG 2100.

Credit-Hour Requirements

There are two options within this degree program:

Course work track (requires 60 credit hours)

Project track (requires 48 credit hours)

All students will initially enter the program under the course work track.

Master of Science in Geographic Information Science (Course Work Track)

A minimum of 60 quarter hours is required, including:

GEOG 3000 Advanced Geographic Statistics
 GEOG 3010 Geographic Information Analysis
 GEOG 3130 Advanced GIS
 GEOG 3140 GIS Database Design
 GEOG 3200 Remote Sensing
 GEOG 4000 Fundamental Geographic Perspectives
 GEOG 4100 Application Design and Production
 GEOG 4900 Geography Colloquium
 GEOG 4994 Report

At least 16 hours of geography or geology course work and at least 12 hours of electives are required. No more than 24 quarter hours will be accepted in transfer from the GIS certificate program.

DEGREE REQUIREMENTS (CONTINUED)

Master of Science in Geographic Information Science (Project Track)

Students interested in pursuing the project option must reach an agreement with a faculty member willing to advise them on a mutually acceptable project.

A minimum of 48 quarter hours is required, including:

GEOG 3000 Advanced Geographic Statistics
 GEOG 3010 Geographic Information Analysis
 GEOG 3140 GIS Database Design
 GEOG 3150 GIS Project Management
 GEOG 3200 Remote Sensing
 GEOG 4000 Fundamental Geographic Perspectives
 GEOG 4020 Geographic Research Methodology
 GEOG 4040 Project Identification
 GEOG 4900 Geography Colloquium
 GEOG 4993 Project

At least 12 hours of geography or geology course work and at least eight hours of electives are required. No more than 24 quarter hours will be accepted in transfer from the GIS certificate program. The identification of a project is the purpose of the one-unit Project Identification course, typically taken during the spring quarter of the first year of attendance.

Project

Students will be required to produce a final project of professional quality demonstrating their ability to apply geographic information science to the chosen area of specialization. The project is done for, and with, a company, agency, nongovernmental organization or faculty member who is referred to as the client. The project must be used by the client and may be predominantly technical in nature or may include a research component. The project must demonstrate a mastery of one or more of the several geospatial technologies. It must require the student to engage in all facets of a project, from design to implementation.

Project Presentation

Each student is required to prepare and present a project proposal and have it formally approved by his/her faculty committee.

Final Project Examination

Upon completion of required course work, proposal approval and the project, each student will undergo a final project examination. This exam is usually about two hours in length. The examination will address the requirements of the project research.

Master of Science in Geographic Information Science (Online Degree Option)

This option is designed for people wishing to complete the degree via an online format.

Basic requirements

Completion of a minimum of 48 credit hours that includes all required course work
 Completion of a capstone project (committee approved)
 Presentation of the capstone project at a professional forum

Prerequisites

Introduction to GIS — students entering the online MS in GISc degree program should have already completed an introductory GIS course at another academic institution, in the department of geography, or in the University College GIS certificate program. The introductory course GIS 3100 in the GIS certificate program fulfills this requirement. Work experience may be used to waive this prerequisite. Students must provide ample evidence on professional resume and be prepared to complete a basic GISc competency exam.

MS in GISc students are expected to be well versed in introductory statistics and cartography. Students are advised to take a statistics and cartography course prior to enrolling in graduate level classes.

Course work structure

Required courses (20 credits) Geography/GIS Electives (20 credits)
 Capstone Courses (8 credits)

Required course work (20 credits)

GEOG 3000 Advanced Geographic Statistics
 GEOG 3010 Geographic Information Analysis
 GEOG 3140 GIS Database Design
 GEOG 3150 GIS Project Management or GIS 3150 GIS Project Management (GIS Project Management is required for MS in GISc degree and GIS certificate)
 GEOG 3200 Remote Sensing or GIS 4700 Introduction to Remote Sensing (Remote Sensing is elective in GIS certificate program)

Geography/GIS Elective Courses: (a minimum of 20 credits)

GEOG 3040 GPS for Resource Mapping
GEOG 3410 Urban Applications in GIS
GEOG 3860 GIS Applications for Natural Resources
GEOG 3130 Advanced Remote Sensing
GIS 4530 Crime Mapping and Analysis
GIS 4630 Public Domain Data for GIS
GIS 4650 Demographic Analysis
GIS 4680 Environmental Applications
GIS 4685 GIS and Natural Hazards
GIS 4690 GPS for GIS
GIS 4740 Digital Image Processing
GIS 4860 Internet Mapping

Capstone Courses (8 credits)

GEOG 4020 Research methods (3 credits)
GEOG 4040 Project identification (1 credit)
GEOG 4993 Capstone Project (4 credits)

Capstone Presentation

Students preparing to graduate are expected to present the results of their capstone projects at a professional gathering. This can be a dedicated GISc meeting or conference. It can also be a topical meeting or conference, for example, a water industry or environment-focused gathering. Students may present a paper or participate in a conference poster session. There are numerous opportunities to present one's work throughout the world and it is important for students to become involved in the GISc community.

FACULTY

E. Eric Boschmann

Assistant Professor
PhD, The Ohio State University, 2008
Research interests: urban, economic, commuting,
mixed- methods, GIS

J. Michael Daniels

Associate Professor
PhD, University of Wisconsin-Madison, 2002
Research interests: geomorphology, environmental
change, soils, hydrology

Russell T. Fielding

Lecturer and Director, Internship program
PhD, Louisiana State University, 2010
Research interests: cultural and environmental
geography, local food production, sustainability and
natural resources, human ecology, tourism, GIS

Andrew R. Goetz

Professor; Chair
PhD, The Ohio State University, 1987
Research interests: transportation, urban
geography/planning, economic geography

Hillary B. Hamann

Senior Lecturer
PhD, University of Colorado at Boulder, 2002
Research interests: hydrology, watershed
biogeochemistry, physical geography, water
resources, conservation

Steven R. Hick

Lecturer; Director of MS in GISc Program and
Geographic Technology Applications Center (GTAC)
MA, University of Missouri, 1983
Research interests: GISc, project management,
cartography, criminology

Michael J. Keables

Associate Professor; Interim Dean, School of
Engineering and Computer Science
PhD, University of Wisconsin-Madison, 1986
Research interests: climatology, water resources,
climate variability

Michael W. Kerwin

Associate professor; Director, Environmental Science
program
PhD, University of Colorado at Boulder, 2000
Research interests: Quaternary geology,
dendroclimatology

Jing Li

Assistant Professor
PhD, George Mason University, 2012
Research interests: 3D/4D Geovisualization and Visual
Analytics, Spatial Temporal Modeling and Analysis,
Web-based Geographic Information Science (GISc),
High Performance Geocomputation, Spatial Cloud
Computing

Rebecca L. Powell

Assistant Professor
PhD, University of California, Santa Barbara, 2006
Research interests: human-environment interaction,
remote sensing, statistics, natural resources
management, land use/land cover, geographic
information science

Donald G. Sullivan

Associate Professor
PhD, University of California, Berkeley, 1989
Research interests: Quaternary studies, biogeography,
environmental change

Paul C. Sutton

Professor Studies
PhD, University of California, Santa Barbara, 1999
Research interests: GISc, ecological economics,
human- environment interactions, population
geography

Matthew J. Taylor

Associate Professor, Director of Graduate Studies
PhD, Arizona State University, 2003
Research interests: Latin America, political ecology,
development

Erika Trigosso Rubio

Lecturer

PhD, University of Oxford, 2010

Research interests: vulnerability and adaptation to
climate change, Geographic Information Science, Latin
America

COURSE DESCRIPTIONS

GEOG 3000 Advanced Geographic Statistics (4 qtr. hrs.)

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 qtr. hrs.)

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.

GEOG 3030 Advanced Field Methods (4 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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.

GEOG 3140 GIS Database Design (4 qtr. hrs.)

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.

COURSE DESCRIPTIONS (CONTINUED)

GEOG 3150 GIS Project Management (4 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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

GEOG 3310 Culture/Nature/Economics-Human Ecology (4 qtr. hrs.)

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 qtr. hrs.)

GEOG 3340 Geographies of Migration (4 qtr. hrs.)

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 3400 Urban Landscapes (4 qtr. hrs.)

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.

COURSE DESCRIPTIONS (CONTINUED)

GEOG 3410 Urban Applications in GIS (4 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 3470 GIS & Environmental Health Geography (4 qtr. hrs.)

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 qtr. hrs.)

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.

COURSE DESCRIPTIONS (CONTINUED)

GEOG 3510 Biogeography (4 qtr. hrs.)

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 qtr. hrs.)

Spatial variation in soil characteristics; soil processes, soil morphology, their application in soil studies. Prerequisite(s): GEOL 2010 or equivalent or instructor's permission. Recommended prerequisite(s): general chemistry.

GEOG 3550 Topics in Physical Geography (1 to 5 qtr. hrs.)

Investigations into various aspects of physical environment.

GEOG 3560 Fluvial Geomorphology (4 qtr. hrs.)

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: GEOL 3540 or instructor approval.

GEOG 3600 Meteorology (4 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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. Prerequisites: GEOG 1201 required; GEOG 3600 or GEOG 3610 recommended.

GEOG 3630 Dendroclimatology (2 to 4 qtr. hrs.)

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 3700 Environment & Development (4 qtr. hrs.)

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 to 4 qtr. hrs.)

Topics vary by instructor.

COURSE DESCRIPTIONS (CONTINUED)

GEOG 3710 Environmental Change in the Eastern Mediterranean (2 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 3740 Environmental Justice in the City (4 qtr. hrs.)

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 3800 Geography of Colorado (4 qtr. hrs.)

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. Prerequisite: GEOG 1201, 1202, and 1203 strongly recommended.

GEOG 3830 Natural Resource Analysis & Planning (4 qtr. hrs.)

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 qtr. hrs.)

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.

COURSE DESCRIPTIONS (CONTINUED)

GEOG 3860 GIS Applications and Natural Resources (4 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 qtr. hrs.)

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 Process Geomorphology (4 qtr. hrs.)

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, students become familiar with various methods of geomorphic analysis through the laboratory component of the class. Prerequisite: GEOG 1202 or GEOG 1217 or instructor's permission.

GEOG 3920 Remote Sensing Seminar (4 qtr. hrs.)

Special topics in advanced remote sensing.

GEOG 3930 Cultural Geography Seminar (4 qtr. hrs.)

Topics, methods and current research in cultural geography.

GEOG 3940 Urban Geography Seminar (4 qtr. hrs.)

International comparison of economic and social, positive and negative aspects of urban systems. Prerequisite: GEOG 3400 or GEOG 3420.

GEOG 3950 Physical Geography Seminar (2 to 4 qtr. hrs.)

COURSE DESCRIPTIONS (CONTINUED)

GEOG 3955 Pollen Analysis Seminar (3 qtr. hrs.)

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 qtr. hrs.)

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 to 5 qtr. hrs.)

GEOG 3992 Directed Study (1 to 10 qtr. hrs.)

GEOG 3995 Independent Research (1 to 5 qtr. hrs.)

GEOG 3999 Geographic Internship (1 to 5 qtr. hrs.)

Supervised internship in a government office at local, state or federal level or within private sector. Prerequisites: 15 quarter hours in geography and approval of department. Maximum of 10 quarter hours total.

GEOG 4000 Fundamental Geog Perspective (3 qtr. hrs.)

A foundation course for persons in the community, without a degree in geography, who want to pursue an education in or make use of computer-based geographic technology but who need a foundation in geographic concepts and perspectives.

GEOG 4020 Geog Research Methodology (3 qtr. hrs.)

GEOG 4030 Advanced Field Research (1 to 5 qtr. hrs.)

GEOG 4040 Research Topic Identification (1 to 2 qtr. hrs.)

GEOG 4100 Application Design/Production I (4 qtr. hrs.)

First of a two quarter sequence designed to be a culminating educational experience. Primarily lab-based with some lecture material, the various application requirements and guidance on how to go about accomplishing Application Design and Production tasks is provided. Prerequisites: GEOG 2000, 2100/3100 or equivalent.

GEOG 4105 Application Design/Production II (4 qtr. hrs.)

This course places emphasis on programming and producing technical reports and/or papers that will be published in the Geography Department's on-line applications library. Prerequisite: GEOG 4100.

GEOG 4410 Economic Geography (4 qtr. hrs.)

The study of the location and spatial organization of economic activities at the local, national, and global scales. Concerned with the spatial configuration of firms, networks, industries, and regions within the emerging global economy.

GEOG 4460 Air Transportation & Tourism (4 qtr. hrs.)

This course will be cross listed with GEOG 3460 Air Transportation & Tourism.

COURSE DESCRIPTIONS (CONTINUED)

GEOG 4584 Geographic Information Systems for Humanitarian Assistance (4 qtr. hrs.)

This class prepares students for future employment and enables them to bring more wisdom and expertise to the practice of their professions. Geographic Information Systems (GIS) technology is critical to support decision making throughout the process of response, assistance, and development – key stages in any humanitarian action. Much of the information practitioner's encounter is spatial in nature and GIS provides a toolbox from which to better understand and utilize this type of information. This class introduces students to GIS technology functionality and information management, and examines GIS' usefulness in humanitarian response. Today, GIS is an essential technology for emergent managers which support decision making on various levels during preparedness, mitigation, response and recovery. One of the main reasons for that is that much of the information is spatial by nature. Additionally, geospatial and geospatial-temporal analysis of data allows us to quickly access and display relevant information through the creation of maps and reports. This course introduces students to the theoretical principles of geographic information systems and examines its potential for humanitarian assistance through case studies and hands-on training with GIS software. Prerequisite: INTS 4056.

GEOG 4701 Topics in Geography (4 qtr. hrs.)

Topics vary by instructor.

GEOG 4810 Geography of Latin America (4 qtr. hrs.)

In this course, we examine how past and present cultural preferences and political economies effect changes in Latin American landscapes.

GEOG 4900 Graduate Colloquium in Geog (1 to 3 qtr. hrs.)

Solid foundation in history and philosophy of the discipline of geography; basis for further exploration of major research specialization.

GEOG 4930 Nicaragua: Development Dilemmas (4 qtr. hrs.)

This class takes students to post-revolutionary Nicaragua to examine the consequences of recent land grabs by

foreigners and transnational companies. Students learn to operate in a country with minimal "western" infrastructure. They learn to examine developing landscapes (that is, resorts and tourism infrastructure) with new eyes and from the perspective of locals who have been left out of the development loop. By the end of the class, students begin to understand the "development game", begin to question the role of tourism in developing economies, begin to know how to interact with other cultures, and finally learn to question the landscapes we "see" and begin to peel back the layers to understand the social and physical evolution of the landscape before their eyes. This class takes an experiential approach and requires students to participate in a service learning experience. Service learning is defined as a course-based, credit bearing educational experience in which faculty, students, and community members participate in an organized service activity that addresses a self-identified community need. We work with several community-based and non-governmental organizations to ensure a good fit between community needs and student expertise.

GEOG 4950 Advanced Field Research (1 to 17 qtr. hrs.)

GEOG 4991 Independent Study (1 to 5 qtr. hrs.)

GEOG 4992 Directed Study (1 to 10 qtr. hrs.)

GEOG 4993 Capstone or Project (1 to 4 qtr. hrs.)

Includes technical design and development for MA geotechnical track project and MS-GIS capstone project.

GEOG 4994 Report (1 to 5 qtr. hrs.)

GEOG 4995 Independent Research (1 to 5 qtr. hrs.)

Includes field research for doctoral dissertation.

GEOG 4999 Geographic Internship (1 to 5 qtr. hrs.)

GEOG 5991 Independent Study (1 to 5 qtr. hrs.)

GEOG 5992 Directed Study (1 to 5 qtr. hrs.)

GEOG 5995 Independent Research (1 to 10 qtr. hrs.)

For More Information

A complete description of the program's official offerings and requirements is available from the department at <http://www.geography.du.edu>.

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