



GEOGRAPHY 2011–2012

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, the University of Denver is an ideal laboratory for physical and human geographers.

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 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, political ecology, population geography, Quaternary studies, remote sensing, soils, spatial analysis, sustainability, transportation, and urban geography and planning. With ten tenure-line faculty and three 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 half of the faculty having earned major teaching awards.

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Geography
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Denver, CO 80208
303-871-2513
<http://www.geography.du.edu>

APPLICATION PROCESS

Following are the simple steps to apply for graduate study in Geography at the University of Denver. If you have any questions about the process, please contact the Office of Graduate Studies.

1. Apply Online / Application Deadlines

Applications for graduate study in Geography at the University of Denver must be submitted online. All materials must be received in the Office of Graduate Studies by the program's stated deadline. For the MS in GIS program, applications are accepted on a year-round basis. Applications will be reviewed four times a year: January 15 (fall quarter admission and financial aid consideration), March 20 (fall quarter admission), September 20 (winter quarter admission), and December 20 (spring quarter admission). The Department will review for summer admission only for MSGIS online applicants. For the MA and PhD programs, applications are accepted once a year. The deadline is January 15 for fall quarter admission and financial aid consideration.

To apply online, visit: www.du.edu/apply/graduates/index.html. A \$60 non-refundable application fee is required for an application to be processed. Application fee waivers are available for McNair Scholars.

2. Transcripts / Course and Degree Prerequisites and Requirements

An appropriate undergraduate degree in geography or related discipline is normally required with a minimum GPA of 3.0. A master's degree in geography or cognate discipline with a minimum GPA of 3.5 in graduate courses is normally required for admission to the doctoral program. If bachelor's and master's degrees are not in geography, the following prerequisites are required: introductory physical geography, introductory human geography, computer cartography, and geographic statistics.

Applicants are required to submit an official transcript from each post-secondary institution attended, or are presently attending, where two quarter hours (or one semester hour) or more were completed. Proof of a bachelor's, and if applicable, a master's degree from a regionally accredited college or university is required. Applicants must also account for any study undertaken outside the United States. If study abroad course work with grades and course titles do not appear on a transcript, those records must be obtained as well. All transcripts must be official and received in the Office of Graduate Studies in a sealed envelope. University of Denver students and alumni do not need to provide DU transcripts as these will be requested by the Office of Graduate Studies.

Transcripts issued in a language other than English must be accompanied by a certified English translation. Students who have earned a degree outside the U.S. must also submit proof of graduation, typically through a degree certificate or diploma. If you have been educated outside the U.S., we encourage you to contact the Office of Graduate Studies for assistance regarding transcript-related materials. DU's in-house foreign credential evaluation may take up to four weeks. This evaluation must be complete by the program's stated deadline. Applicants with education credentials from outside of the U.S. are encouraged to apply early.

3. Test Scores

The Graduate Record Examination (GRE) general test is required of all applicants, with a combined score of at least 1000 on the verbal and quantitative sections of the exam. Scores must be received directly from the appropriate testing agency by the program's stated deadline. The institution code for the University of Denver is 4842. For the MS in GIS program only: Applicants who have completed at least 12 hours in the University's GIS certificate program, with a GPA of 3.5 or better, could waive the GRE requirement or the undergraduate GPA requirement, but not both. Students who have completed the certificate program can automatically waive the GRE requirement.

Non-native English speakers are required to provide scores from either the Test of English as a Foreign Language (TOEFL) or the International English Language Testing System (IELTS). Please note: this requirement is independent of citizenship status.

The minimum TOEFL score accepted by DU's Geography graduate programs is 88 (iBT) or 570 (paper-based). The minimum IELTS score accepted by Geography is 6.5. Non-native English speakers who hold a post-secondary degree from an institution where English is the only language of instruction and examination or who hold a regionally accredited baccalaureate degree from a U.S. institution are exempt from the TOEFL/IELTS requirement. There are no exemptions for graduate teaching assistants.

Graduate Teaching Assistants (GTAs) must demonstrate fluency in spoken English by scoring a 26 on the TOEFL speaking section or 8.0 on the IELTS speaking section. Please visit www.du.edu/media/documents/graduates/toefl.pdf for a list of TOEFL/IELTS requirements.

4. Personal Statement

A personal statement of at least 300 words is required. The statement should be submitted via upload through the online application process. The personal statement should include information concerning your life, education, practical experience, special interests and specific purpose for applying to the University of Denver.

5. Recommendation Letters

Three letters of recommendation are required. These letters should be solicited and uploaded by recommenders through the online application system. Letters must be received by the program's stated deadline.

APPLICATION PROCESS (continued)

6. Financial Support

To be considered for financial support, domestic applicants should apply early and submit the Free Application for Federal Student Aid (FAFSA) by the priority deadline. There is a supplemental form for the MS in Geographic Information Science program. This form should be uploaded with the application by applicants seeking departmental scholarships or grant aid. The MS in GIS provides funding including merit-based aid, such as graduate scholarships and teaching assistantships, as well as a limited amount of need-based grant aid.

Information about financial aid can be found on the Office of Financial Aid website [insert URL]. International students are not eligible for federal financial aid.

7. Application Status

We encourage you to be actively engaged in the admission process. You can check your application status online at myWeb.

Mailing Address

Mail official transcripts and any supplemental admission materials not submitted with the online application to:

University of Denver
Office of Graduate Studies
Mary Reed Building, Room 5
2199 S. University Blvd.
Denver, CO 80208-4802

International Applicants

For complete international applicant information, please visit the Office of Graduate Studies' International Student Application Information. International applicants are strongly encouraged to submit a complete admission packet at least eight weeks prior to the program's application deadline.

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 Examination

Upon completion of required course work, proposal approval and the thesis, each student will undergo a final oral examination. 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.

DEGREE REQUIREMENTS *(continued)*

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 135 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, the dissertation proposal has been approved, and 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.

Final Exam

Upon completion of course work, approved proposal, comprehensive exam and the dissertation, each student will undergo a final oral examination. A final examination 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 examination is to be conducted at least two weeks before the end of the quarter in which the degree is to be awarded. This exam 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, 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 52 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 4900 Geography Colloquium
- GEOG 4994 Report

DEGREE REQUIREMENTS *(continued)*

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.

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 52 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 project (committee approved)
- Presentation of the 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)

DEGREE REQUIREMENTS *(continued)*

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

Sharolyn Anderson

Assistant professor
PhD, Arizona State University, 2002
Research interests: GISc, spatial-temporal analysis, natural resource assessment, remote sensing, environment

E. Eric Boschmann

Assistant professor
PhD, The Ohio State University, 2008
Research interests: urban geography, accessibility, mixed-methods, economic geography

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: 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

David B. Longbrake

Emeritus professor
PhD, University of Iowa, 1972

Research interests: statistics, GPS, urban geography/planning

FACULTY

Rebecca L. Powell

Assistant professor

PhD, University of California, Santa Barbara, 2006

Research interests: human-environment interaction, remote sensing, natural resources management, land use/land cover

Donald G. Sullivan

Associate professor

PhD, University of California, Berkeley, 1989

Research interests: Quaternary studies, biogeography, environmental change

Paul C. Sutton

Associate professor; Director of Graduate Studies

PhD, University of California, Santa Barbara, 1999

Research interests: GISc, ecological economics, human-environment interactions, population geography

Matthew J. Taylor

Associate professor

PhD, Arizona State University, 2003

Research interests: cultural geography, Latin American geography

Erika Trigos 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

Techniques, examples of geographic statistics and data processing methods in various specialized fields of geography. Prerequisite: GEOG 2000. 4 qtr. hrs.

GEOG 3010 Geographic Information Analysis

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 among GIS, spatial data and statistical analysis. 4 qtr. hrs.

GEOG 3020 Advanced Computer Cartography

Design and construction of thematic maps using more complex techniques than mastered in beginning course, e.g. color and directional time series point symbols. Prerequisite: GEOG 2020. 4 qtr. hrs.

GEOG 3030 Advanced Field Methods

Various field methods used by researchers in physical geography. Techniques include field mapping, laboratory analyses and geologic field methods. Prerequisite: GEOG 1201 or equivalent. 4 qtr. hrs.

GEOG 3040 GPS for Resource Mapping

This course is an introduction to GPS 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. 4 qtr. hrs.

GEOG 3100 Geospatial Data

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. 4 qtr. hrs.

GEOG 3110 GIS Modeling

This course focuses on 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. Lectures, discussions and independent exercises provide a foundation for creative application of GIS technology in spatial reasoning and decision-making. 4 qtr. hrs.

COURSE DESCRIPTIONS

GEOG 3130 Advanced Geographic Information Systems

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. 4 qtr. hrs.

GEOG 3140 GIS Database Design

Designing databases to provide a foundation for GIS functions and applications, including investigating techniques used for designing databases in nonspatial 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 3100. 4 qtr hrs.

GEOG 3150 GIS Project Design and Management

Provides graduate students seeking a GIS career, or anyone managing a GIS project, with the knowledge, skills and ability to take a 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. 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. 4 qtr. hrs.

GEOG 3200 Remote Sensing

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 and discussed and include hands-on applications. 4 qtr. hrs.

GEOG 3230 Advanced Remote Sensing

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 radioactive 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 GIS analysis. Prerequisite: GEOG 3200. 4 qtr. hrs.

GEOG 3300 Cultural Geography

Themes and methods of cultural geography including cultural area, landscape, history and ecology. 4 qtr. hrs.

GEOG 3310 Culture, Nature and Economy (Human Ecology)

Cultural adaptation, livelihood strategies and environmental modification among subsistence and peasant societies, and responses of such groups to technological change and economic integration. 4 qtr. hrs.

GEOG 3320 Global Change — Human Dimensions

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. 4 qtr. hrs.

GEOG 3330 Political Geography

Political geographers are concerned with the geographical factors and consequences of political decisions and actions. This class explores the political process of domestic and international affairs, as well as the geopolitical environment of conflict, state formation, foreign policy and international relations. 4 qtr. hrs.

GEOG 3340 Geographies of Migration

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. Also addressed is 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 social and economic change 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. 4 qtr. hrs.

COURSE DESCRIPTIONS *(continued)*

GEOG 3400 Urban Landscapes

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; and globalization. 4 qtr. hrs.

GEOG 3410 Urban Applications in GIS

This course explores several ways to analyze the urban environment using a GIS. Datasets of points (e.g. residential locations of survey respondents), lines (existing and proposed light rail lines), polygons (e.g. census tracts) and pixels (e.g. air photos and satellite imagery) are used to perform various analyses. Student interests define what kinds of analyses are performed. Examples include: characterizing the propensity of Denver metro-area citizens to ride light rail — does residential location matter? Is there a quantitative relationship between nighttime light emissions and population density in Colorado cities? How do Denver-area residents' perceptions of crime in their own neighborhoods relate to actual crime statistics for the location? The sequence of events for the course is question formulation, design of analysis and analysis. If any explorations produce interesting results, students are encouraged to take an independent study course (GEOG 3991) in the following quarter to write and publish their results. 4 qtr. hrs.

GEOG 3420 Urban and Regional Planning

Historical evolution of planning theory and practices; comprehensive planning process; legal, political, economic, social and 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; and national planning. 4 qtr. hrs.

GEOG 3425 Urban Sustainability

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 socioeconomic 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. 4 qtr.hrs.

GEOG 3430 Land Use: Planning, Policy and Urban Growth

As part of the planning sequence in geography, this course focuses on how land is used in both urban and rural contexts. Emphasis is on the U.S. experience, especially land-use issues in the American West. Topics include the historical, political, economic, social and environmental aspects of land use, as well as the relationship of land use planning to the comprehensive urban-planning process. 4 qtr. hrs.

GEOG 3440 Urban Transportation Planning

This is 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 impact of light rail transit, the planning and implementation of highway projects, and the role of freight and passenger transportation companies in transportation planning. 4 qtr. hrs.

GEOG 3460 Air Transportation and Tourism

This course delves into the world of commercial air-passenger transportation, studying the foundations of the industry, its role in 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. 4 qtr. hrs.

GEOG 3470 GIS and Environmental Health Geography

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. 4 qtr. hrs.

GEOG 3500 Reconstructing Quaternary Environments

Nature, magnitude, sequence, causes of Pleistocene and Holocene climatic changes; effects of climatic change on plant/animal distributions, human populations; paleoclimatic research methods. Laboratory, field trips. Prerequisite: GEOG 1201, GEOG 1202, GEOG 1203, ENVI 3000 or instructor's permission. 4 qtr. hrs.

COURSE DESCRIPTIONS (continued)

GEOG 3510 Biogeography

Biogeography focuses on present and past distributions of plants and animals. 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.

4 qtr. hrs.

GEOG 3520 Geography of Soils

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

4 qtr. hrs.

GEOG 3530 Groundwater Hydrology

This course investigates the physical processes governing subsurface water. Topics include hydrologic principles controlling aquifers, use of groundwater as a water resource, agricultural applications of groundwater, wells and human impact on groundwater quality and supply. 4 qtr. hrs.

GEOG 3540 Reclamation of Disturbed Land

A variety of human activities disturb natural environmental systems. The principles and practices used to reclaim disturbed lands to productive uses are the focus of this course. Prerequisites: GEOG 1201, GEOG 1202, GEOG 1203 or equivalent. 4 qtr. hrs.

GEOG 3550 Topics in Physical Geography

Investigations into various aspects of physical environment. 1–5 qtr. hrs.

GEOG 3560 Fluvial Geomorphology

Examines how water and sediment interact at the 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's permission. 4 qtr. hrs.

GEOG 3600 Meteorology

The basic theory and skills of weather forecasting. Topics include through 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.

4 qtr. hrs.

GEOG 3610 Climatology

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 variety of computer simulations. 4 qtr. hrs.

GEOG 3620 Applied Climatology

Climatic impact on environmental systems and human behavior; techniques to investigate climatic characteristics of environmental extremes (floods, blizzards), urban climatology, socioeconomic impacts of climate. Prerequisites: NATS 1201 required; GEOG 3600 or GEOG 3610 recommended. 4 qtr. hrs.

GEOG 3630 Dendroclimatology

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: instructor's permission. 4 qtr. hrs.

GEOG 3700 Environment and Development

Course examines interrelated nature of environmental and development issues in the Third World; addresses the place of environment in development theory and practice. The political ecology of Third World environmental problems and sustainable development approaches. 4 qtr. hrs.

GEOG 3701 Topics in Geographic Information Science

Special topics in GISc. Topics vary by instructor. 1–4 qtr. hrs.

GEOG 3710 Environmental Change in the Eastern Mediterranean

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. 2 qtr. hrs.

COURSE DESCRIPTIONS (continued)

GEOG 3720 Mountain Environments and Sustainability

This course 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, GEOG 1202, and GEOG 1203 or instructor's permission. 4 qtr. hrs.

GEOG 3730 International Environmental Policy

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. 4 qtr. hrs.

GEOG 3740 Environmental Justice in the City

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. 4 qtr. hrs.

GEOG 3800 Geography of Colorado

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 foundation course strongly recommended. 4 qtr. hrs.

GEOG 3830 Resource Analysis and Planning

Natural resources provide the basis for all human agricultural and industrial activities. This course discusses our resource distribution, conservation, management and sustainable use. 4 qtr. hrs.

GEOG 3840 Water Resource Analysis

A focus on complex policy, economic and local, national and international, and political issues surrounding resource use in the western United States. Issues include development and conservation of water resources; exploitation of nonrenewable and renewable energy and mineral resources; and flexible responses to changing public policy. 4 qtr. hrs.

GEOG 3850 Renewable Energy Technologies

Our dependency on fossil fuels has been in the forefront of energy discussions for more than 30 years. Energy experts currently predict that peak world oil production will be reached near the beginning of the 21st Century, and will decline steadily thereafter. The Middle East and OPEC countries, areas associated with frequent political unrest, control most of the world's oil supply. Education in alternative and renewable energy sources is critical to ensuring a good energy usage mix for future generations. This course is intended to help students understand alternative and renewable energy technologies that have been developed and know what the positive and negative aspects are of each source. U.S. energy policy will be discussed briefly. A cost-benefit analysis for each form of alternative energy will be studied to assist students in determining which alternative/renewable energy types are practical on a large scale. Particular attention will be paid to the efficiency of each source, as well as limitations in the extraction of usable energy from each source. 4 qtr. hrs.

GEOG 3860 GIS Applications — Natural Resources

In this course, we use a case-study approach to examine domestic and international natural resources such as oil, coal, timber, minerals and recycled materials. We 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 use GIS data and analysis to enhance our understanding of these case studies, and students complete 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. 4 qtr. hrs.

GEOG 3870 Water Resources and Sustainability

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 United States 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. 4 qtr. hrs.

GEOG 3880 Cleantech and Sustainability

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, sound foreign policy, and will accelerate poverty alleviation. 4 qtr. hrs.

COURSE DESCRIPTIONS (continued)

GEOG 3890 Ecological Economics

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. 4 qtr. hrs.

GEOG 3910 Process Geomorphology

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 landforms that result. In addition, the student becomes familiar with various methods of geomorphic analysis through the laboratory component of the class. 4 qtr. hrs.

GEOG 3920 Remote Sensing Seminar

Varying topics; based on instructor; independent research project. Prerequisites: GEOG 3200 and instructor's permission. 4 qtr. hrs.

GEOG 3930 Cultural Geography Seminar

Topics, methods and current research in cultural geography. 4 qtr. hrs.

GEOG 3940 Urban Geography Seminar

International comparison of economic and social, positive and negative aspects of urban systems. Prerequisite: GEOG 3400 or GEOG 3420. 4 qtr. hrs.

GEOG 3950 Physical Geography Seminar

Selected aspects of physical geography. Varying topics, based on instructor. 4 qtr. hrs.

GEOG 3955 Pollen Analysis Seminar

Pollen grains preserved in sediment provide long-term records of vegetation conditions. Changing proportions of pollen types may reflect climatic fluctuation or human impact. This course reviews 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. Prerequisite: NATS 1203, Limited Enrollment Card. 3 qtr. hrs.

GEOG 3980 Regional Geography Seminar

Part or all of specific regional divisions such as Europe, Asia, Africa, Oceania, South America, North America. 4 qtr. hrs.

GEOG 4000 Fundamental Geographic Perspectives

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. 3 qtr. hrs.

GEOG 4020 Geographic Research Methodology

Principles of geographic research; literature review, critique; research subfields; research proposal writing. Prerequisite: graduate standing. 3 qtr. hrs.

GEOG 4030 Advanced Field Research

Closely supervised research in field to improve field techniques, expand subject knowledge and develop additional competence. 5 qtr. hrs. max.

GEOG 4040 Research Topic Identification

Development of research topic, methodology and techniques of field research for either master's or doctoral students. 2 qtr. hrs. max.

GEOG 4100 Application Design and Production

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, GEOG 2100, GEOG 3100 or equivalent. 4 qtr. hrs.

GEOG 4410 Economic Geography

This course studies 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. 4 qtr. hrs.

GEOG 4460 Air Transportation and Tourism

This course will be cross-listed with GEOG 3460 (Air Transportation and Tourism). 4 qtr. hrs.

GEOG 4810 Geography of Latin America

In this course, we examine how past and present cultural preferences and political economies effect changes in Latin American landscapes. 4 qtr. hrs.

GEOG 4900 Graduate Colloquium

1-3 qtr. hrs. max.

GEOG 4991 Independent Study

1-5 qtr. hrs. max.

GEOG 4993 Capstone or Project

Includes technical design and development for MA geotechnical track project and MS in GISc capstone project. 1-4 qtr. hrs.

COURSE DESCRIPTIONS (continued)

GEOG 4994 Report

1 qtr. hr.

GEOG 4995 Independent Research

1–5 qtr. hrs. max.

GEOG 4999 Geographic Internship

1–5 qtr. hrs. max.

GEOG 5991 Independent Study

1–5 qtr. hrs. max.

GEOG 5995 Independent Research

1–5 qtr. hrs. max.

GEOL 3010 Process Geomorphology

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 landforms that result. In addition, the student becomes familiar with various methods of geomorphic analysis through the laboratory component of the class. Prerequisite: GEOL 1010, GEOG 1202 or instructor's permission. 4 qtr. hrs.

GEOL 3100 Environmental Geology

Environmental geology examines geologic hazards, both natural and those attributable to human impacts on the environment. Specific topics may include disposal of municipal solid waste and radioactive waste; earthquake and volcanic hazards; groundwater pollution and withdrawal; mass-wasting phenomena; and energy-related issues. Prerequisite: GEOL 1010, GEOG 1203 or instructor's permission. 4 qtr. hrs.

GEOL 3200 Sedimentology/Stratigraphy

This course reviews the origin and geologic history and depositional environment of sediment and sedimentary rocks. Course work concentrates on the identification of sedimentary rocks and depositional environments by firsthand observations of rocks in the Denver area. Prerequisite: GEOL 1010, GEOG 1203 or instructor's permission. 4 qtr. hrs.

GEOL 3300 Petroleum Geology

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. 4 qtr. hrs.

GEOL 3520 Erosion Process and Measurement

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. 4 qtr. hrs.

GEOL 3540 Hydrology

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), and the geologic settings of groundwater, the basic physics of groundwater flow, and water supply and use. Prerequisite: GEOL 1010, NATS 1203 or instructor's permission. Recommended prerequisite: one introductory statistics course.

4 qtr. hrs.

GEOL 3900 Geomorphology Seminar

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 instructor's permission. 4 qtr. hrs.

ENVI 3000 Environmental Law

Purpose and applications of federal laws pertaining to environmental protection, including NEPA, RCRA, CERCLA, and Clean Water and Clean Air Acts. This course also addresses the role of states in implementation of federal environmental laws.

4 qtr. hrs.

For More Information

The department's website, www.geography.du.edu, offers the most current information on courses, requirements, faculty and student news.

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