

Geography

Department of Geography

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Overview

Geography is primarily concerned with the locations and arrangements in space of human and natural phenomena, and with the interrelationships between people, businesses, public and social institutions, and their spatial environments. Geographers, therefore, are interested in such topics as human perception and behavior; the location of industry and business; mobility and transportation; urban growth and development; regional planning and policy study; physical and ecological environments; interactions of people and places over space and time; and the diffusion of information, commodities, and ideas.

Over the years, geography has developed four major traditions or interrelated approaches. The first tradition is a spatial tradition, with a focus on the importance of distance, direction, position, pattern, and movement as concepts worthy of study themselves, whatever the subject matter. The second tradition is that of area studies, which takes as its objective the characterization and differentiation of places through a thorough accounting of all of the places' aspects and attributes. The third tradition is through a human-land tradition, which, as the name implies, entails a focus upon the interrelationships and interactions between people and their environment. The fourth tradition is the earth-science tradition, which involves a focus upon the study of the earth, the atmosphere, climate, and the living world.

Geographers represent geographic space with maps, and thus geographers are very concerned with map use and design. The design of maps may often involve the application of cognitive psychology, statistics, and mathematics. The development of Geographic Information Systems has revolutionized the mapping of statistics and made possible the rapid production of specialized maps for decision makers.

Because of these wide interests, geographers must acquire training in quantitative methods, field techniques, computer technology, data handling and analysis, cartographic displays and production, and written and verbal communication skills. In addition, interdisciplinary work often is necessary in other disciplines such areas as economics, computer science, sociology, mathematics, marketing, statistics, information systems, and environmental sciences.

About our Degrees

Acceptance Criteria

Minimum GPA of 2.0 overall.
Minimum GPA of 2.0 in any two geography courses.

Acceptance Information

Applications are accepted all year long; forms are available in the Geography main office at 105 Wilkeson. We have about 45 undergraduate applicants each year and currently we have 95 majors enrolled in our program.

Degree Requirements

Please see [Degrees and Policies](#).

About our Courses

Suggested Introductory Courses

- [GEO 100](#) Geography Perspectives and World Issues
- [GEO 101](#) Earth Systems Science I
- [GEO 102](#) Introduction to Human Geography

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- [GEO 103](#) Geography of Economic Systems
- [GEO 120](#) Maps: Earth from Above

The typical class size for:

Freshman/introductory courses is: 50-200
Sophomore/intermediate courses is: 21-100
Upper level/advanced courses is: 21-60

For course descriptions, please see [Courses](#).

About our Faculty

Department of Geography faculty members have an impressive record of publications, national editorships, and research and teaching awards. The quality of teaching has been formally recognized and several professors have been appointed to SUNY Distinguished Professors for Excellence in Teaching. Many faculty members have received research grants, both for work with government agencies and for field work in many parts of the world. In addition, members of our faculty have been recognized for their world-renowned research accomplishments by being appointed SUNY Distinguished Professors and by receiving the Chancellor's Award for Excellence in Scholarship and Creative Activities. These activities give the department multifaceted expertise in applied research, geographic information systems, international trade, and urban and environmental problems.

See a list of our [Undergraduate Faculty](#).

Transfer Policy

Prospective majors who have taken geography courses at another school that they believe are equivalent to courses offered by this department should contact the Director of Undergraduate Studies to petition for acceptance of transfer geography credits.

Extracurricular Activities

[Undergraduate Geography Student Association](#)

Organized and run by students, the club has regular meetings and offers a variety of programs, including field trips, lectures, discussions, sporting events, and picnics.

See the [UB Student Association](#).

Practical Experience and Special Academic Opportunities

Honors, Awards, and Scholarships

[GEO 497](#) Honors Geography is only open to qualified majors. Students enrolled in [GEO 497](#) must complete an honors project under the supervision of a Geography faculty member, and each project is to be read and evaluated by a second faculty member in the department. Students who receive a grade of B or higher in [GEO 497](#) are awarded a special honors certificate following the completion of all requirements for the BA degree in Geography. Qualifying students are awarded certificates of distinction.

Internships

Internships with all levels of government agencies and with businesses are encouraged. Specific internship experiences are arranged based on the individual student's area(s) of specialization.

Career Information and Further Study

Human geography is concerned with the spatial aspects of human existence - how people and their activities are distributed in space, how they use and perceive space, and how they create and sustain the places that make up the earth's surface. Human geographers work in the fields of urban and regional planning, social services, transportation, marketing, real estate, tourism, and international business. Physical geographers study patterns and interactions of climates, land forms, vegetation, soils, and water. They forecast the weather, manage land and water resources, and analyze and plan for forests, rangelands, and wetlands. Many human and physical geographers have skills in cartography and

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Geographic Information Systems (GIS).

Geographers also study the linkages between human activity and natural systems. Geographers were, in fact, among the first scientists to sound the alarm that human-induced changes to the environment were beginning to threaten the balance of life itself. They are active in the study of global warming, desertification, deforestation, loss of biodiversity, groundwater pollution, and flooding.

Career Choices

- Cartographer
- Climatologist
- Computer analyst
- Ecologist
- Economist
- Educator
- Environmental scientist/manager
- Geomorphologist
- GIS specialist
- Health care
- Market research analyst
- Meteorologist
- Natural resource manager
- Researcher
- Urban and transportation planner

Work settings include:

- Consulting Companies
- Engineering and marketing consultants
- GIS Software Development, implementation
- Local, city and/or state planning offices
- Multinational corporations
- Real estate developers
- Social services organizations
- U.S. Army Corps of Engineers
- U.S. Army Topographic Engineering Center
- U.S. Bureau of the Census
- U.S. Bureau of Land Management
- U.S. Defense Mapping Agency
- U.S. Department of Agriculture
- U.S. Economic Development Administration
- U.S. Environmental Protection Agency
- U.S. Forest Service
- U.S. Geological Survey
- U.S. National Aeronautics and Space Administration
- U.S. National Oceanographic and Atmospheric Administration
- U.S. Defense Mapping Agency
- Universities

Additional Resources

- [Association of American Geographers](#)
- [NCGIA \(National Center for Geographic Information and Analysis\)](#)
- [CUSTAC \(Canada United States Trade Center\)](#)

Degree Options

Joint and double majors with other departments in the university are encouraged. Students interested in joint programs are advised to obtain up-to-date information from the departments involved and to contact the Director of Undergraduate Studies in the relevant departments.

Students interested in geography are strongly encouraged to visit the department and talk with the Director of Undergraduate Studies. Once

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students have been accepted as majors, they work with a department advisor and a program is worked out to suit the individual student's needs and goals.

Degrees Offered

Undergraduate: Geography BA, International Trade BA, Geography Minor

Geography BA Concentrations: Geographic Information Systems, Earth Systems Science, and Urban and Regional Analysis.

Graduate: MA, MS, PhD

Links to Further Information About this Program

- [Undergraduate Catalog](#)
- [Undergraduate Admissions](#)
- [Graduate Admissions](#)
- [Department of Geography](#)
- [College of Arts and Sciences](#)

Geography - B.A.

Acceptance Criteria

Minimum GPA of 2.0 overall.

Minimum GPA of 2.0 in the prerequisite courses.

Prerequisite Courses

Any two geography courses.

Required Courses

[GEO 101](#) Earth Systems Science I

[GEO 102](#) Introduction to Human Geography or [GEO 103*](#) Geography of Economic Systems

[GEO 120](#) Maps: Earth from Above

[GEO 211](#) Univariate Statistics in Geography (or another approved statistics course)

One computer science course

One 300/400-level course from each of the following areas: Earth systems science; GIS and cartography; International trade; Urban and regional analysis

Three to four additional Geography electives to bring the total credits in the major to 36

*[GEO 103](#) is mandatory for the five-year BA/MA program.

Summary

Total required credit hours for the major...36

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Recommended Sequence of Program Requirements

FIRST YEAR

Fall General education requirements

Spring General education requirements

SECOND YEAR

Fall Two or three lower-level geography courses (choose from [GEO 101](#); [GEO 102](#) or [GEO 103](#); and [GEO 120](#))

Spring One computer science course, two or three geography electives

THIRD YEAR

Fall [GEO 211](#), two or three geography electives

Spring Two or three geography electives

FOURTH YEAR

Geography

Fall and Spring Remaining geography electives

Concentrations

Required Courses

GEOGRAPHIC INFORMATION SYSTEMS (GIS) AND CARTOGRAPHY

[GEO 101](#); [GEO 102](#) or [GEO 103](#); [GEO 120](#), [GEO 381](#), [GEO 211](#) (formerly [GEO 410](#)), [GEO 411](#), and [GEO 481](#)

Two electives from: [GEO 475](#), [GEO 479](#), [GEO 482](#), [GEO 483](#), [GEO 485](#), [GEO 488](#), [GEO 489](#), [GEO 493](#)

One 300/400-level elective from the Urban & Regional Analysis area

One 300/400-level elective from the GIS/Cartography area

One 300/400-level elective from the International Trade area

One math course: [MTH 121](#) or [MTH 141](#)

One computer course: [CSE 113](#)

EARTH SYSTEMS SCIENCE

[GEO 101](#); [GEO 102](#) or [GEO 103](#); [GEO 120](#), [GEO 211](#) (formerly [GEO 410](#)), [GEO 345](#) or [GEO 347](#); [GEO 350](#); [GEO 352](#) or [GEO 356](#); [GEO 435](#) or [GEO 470](#)

One elective from: [GEO 200](#), [GEO 201](#), [GEO 345](#), [GEO 347](#), [GEO 352](#), [GEO 356](#), [GEO 435](#), [GEO 444](#), [GEO 445](#), [GEO 448](#), [GEO 449](#), [GEO 470](#), [GEO 475](#), [GEO 496](#), [GEO 499](#).

One 300/400-level elective from the Urban & Regional Analysis area

One 300/400-level elective from the GIS/Cartography area

One 300/400-level elective from the International Trade area

Two electives from the following: [BIO 200](#), [BIO 201](#), [CHE 101](#), [CHE 102](#), [PHY 101](#), [PHY 102](#), [MTH 121](#) (or [MTH 141](#))

URBAN AND REGIONAL ANALYSIS

[GEO 101](#), [GEO 102](#), [GEO 103](#), [GEO 120](#), [GEO 211](#) (formerly [GEO 410](#)), [GEO 366](#), [GEO 367](#) and [GEO 411](#), [GEO 481](#).

Two electives from: [GEO 412](#), [GEO 418](#), [GEO 419](#), [GEO 425](#), [GEO 460](#), [GEO 482](#).

One Economics course: [ECO 181](#) or [ECO 182](#)

One 300/400-level elective from the Earth Systems Science area

International Trade - B.A.

Acceptance Criteria

Minimum GPA of 2.0 overall.

Minimum GPA of 2.0 in the prerequisite courses.

Prerequisite Courses

Any two geography courses.

Required Courses

[GEO 100](#) Geographic Perspectives and World Issues or [GEO 101](#) Geographic Perspectives and World Issues

[GEO 102](#) Introduction to Human Geography or [GEO 103](#) Geography of Economic Systems

[GEO 120](#) Maps: Earth from Above

[GEO 211](#) Univariate Statistics in Geography(formerly [GEO 410](#))

[GEO 330](#) Dynamics of International Business

[GEO 333](#) Bases of World Commerce

[GEO 334](#) International Environments and Commercial Problems

[GEO 425](#) Industrial/Business Geography

[GEO 460](#) Geography of Development

Three GEO electives at the 300/400 level - suggested courses are [GEO 345](#), [GEO 366](#), [GEO 367](#), [GEO 389](#), [GEO 411](#), [GEO 412](#), [GEO 418](#), [GEO 419](#), [GEO 426](#), [GEO 470](#), [GEO 481](#), [GEO 482](#)

[ECO 181](#) Macroeconomics

[ECO 182](#) Microeconomics

One computer science course

Summary

Total required credit hours for the major...45

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Recommended Sequence of Program Requirements

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FIRST YEAR

Fall General Education Requirements
Spring General Education Requirements

SECOND YEAR

Fall Two or three lower-level geography courses (choose from [GEO 100](#) or [GEO 101](#); [GEO 102](#) or [GEO 103](#); and [GEO 120](#)) and non-GEO courses

Spring [GEO 211](#), one geography elective, one non-GEO course

THIRD YEAR

Fall [GEO 330](#), [GEO 334](#), and one geography elective

Spring [GEO 333](#), [GEO 425](#), [GEO 460](#), two geography electives, or non-GEO requirements

FOURTH YEAR

Fall and Spring Remaining geography and non-GEO courses.

Geography - B.A./M.A.

Acceptance Criteria

Minimum GPA of 2.9 in the prerequisite courses.

Two letters of recommendation from instructors of the prerequisite courses.

Advising Notes

Acceptance to the MA portion of this program requires submission of GRE scores. We recommend this be done between the third and fourth year.

Most of these courses are only offered once each year; therefore, students need to plan ahead to be certain that they enroll in the required courses during the appropriate semesters.

Students must apply to the department for full-time graduate status by fall of the fifth year.

Prerequisite Courses

[GEO 103](#) and three additional geography courses.

Required Courses

[ECO 181](#) Macroeconomics

[ECO 182](#) Microeconomics

[GEO 120](#) Maps: Earth from Above

[GEO 211](#) Univariate Statistics in Geography

[GEO 330](#) Dynamics of International Business

[GEO 333](#) Bases of World Commerce

[GEO 334](#) International Environment & Commercial Problems

[GEO 366](#) Urban Geography

[GEO 389](#) Business Geographics

[GEO 411](#) Multivariate Statistics in Geography

[GEO 419](#) Transportation and Society

[GEO 425](#) Industrial Geography

[GEO 497](#) Geography Honors Program

[GEO 502](#) Survey Methods in Geography

[GEO 531](#) Introduction to International Trade

[GEO 625](#) Industrial Geography

[GEO 631](#) Project Guidance or [GEO 639](#) Special Topics in Trade

[GEO 632](#) Macro Issues in Trade

[GEO 634](#) World Regional and Cultural Systems

[GEO 636](#) Spatial Problems of Multinational Corporations

[GEO 640](#) Asia-Pacific Economy

[GEO 680](#) Technology, Globalization, and Development

One approved undergraduate-level elective

Two approved graduate-level electives

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Summary

Total required credit hours for the undergraduate portion...46

Total required credit hours for the BA/MA...79

See [Baccalaureate Degree Requirements](#) for general education and remaining university requirements.

Refer to the Graduate School's policies and procedures manual for requirements for master's degree candidates.

Upon completion of undergraduate program requirements and all MA requirements, the combined degree is conferred at the end of the fifth year.

Recommended Sequence of Program Requirements

FIRST YEAR

Fall Four general education courses or electives

Spring Four general education courses or electives

SECOND YEAR

Fall [ECO 181](#), [GEO 103](#), [GEO 330](#), two general education courses or electives

Spring [ECO 182](#), [GEO 120](#), [GEO 333](#), two general education courses or electives

THIRD YEAR

Fall [GEO 366](#), [GEO 389](#), [GEO 211](#), one general education course or elective

Spring [GEO 334](#), [GEO 411](#), [GEO 419](#), [GEO 425](#), one general education course or elective

FOURTH YEAR

Fall [GEO 490](#), [GEO 531](#), [GEO 632](#), one general education course or approved undergraduate-level elective

Spring [GEO 625](#), [GEO 636](#), one general education course or approved undergraduate-level elective, one approved graduate-level elective

FIFTH YEAR

Fall [GEO 502](#), [GEO 634](#), [GEO 680](#), one approved graduate-level elective

Spring [GEO 631](#) or [GEO 639](#); [GEO 640](#)

Geography - Minor

Acceptance Criteria

Minimum GPA of 2.0 overall.

MINORS

Earth Systems Science

General Geography

Geographic Information Systems (GIS) and Cartography

Geography of International Business and World Trade

Urban and Regional Analysis

For detailed information, stop in at the main office, 105 Wilkeson, or contact the director of undergraduate studies.

GEO 100: Geographic Perspectives and World Issues

Credits: 3

Semester(s): Fall, Spring

Type: LEC

Examines the geography of the emerging global village, especially the stress between the increasing globalization of human societies and natural habitats, and their idiosyncratic traits. Deeply rooted in today's changing world, the course surveys regions of the world and the contemporary issues facing them.

GEO 101: Earth Systems Science I

Credits: 3

Semester(s): Fall, Spring

Type: LEC

Earth Systems Science examines modern environmental problems through quantitative methods, analysis, and modeling grounded in basic and applied science and research. The goal of the course is to introduce students to the fundamental processes that dominate

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the atmosphere, hydrosphere, lithosphere, and biosphere, their characteristics and complex interactions, and their impact on human life and society.

GEO 102: Introduction to Human Geography

Credits: 3
Type: LEC

Introduction to thinking about human activities from a geographic perspective. While considering the "why of where," students will be exposed to the global dynamics of urbanization, industrialization, migration, economic development, international relations, geopolitics, and cultural geographies.

GEO 103: Geography of Economic Systems

Credits: 3
Semester(s): Fall, Spring
Type: LEC

Examines the diverse economic systems that characterize a world economy in rapid transition. Highlights the complex processes of globalization and its impact on regions, cities, and countries. Examines the organization of economic activities and resources in the global economy.

GEO 106: Earth Systems Science II

Credits: 4
Semester(s): Fall, Spring
Pre-requisites: [GEO 101](#)
Type: LEC/LAB

Examines climate changes of the past, present and future. Considers the various causes of past and present climate change and how to predict future changes. Describes predicted environmental and social impacts of, and possible solutions to, future climate change.

GEO 120: Maps: Earth from Above

Credits: 3
Semester(s): Fall, Spring
Type: LEC

Provides the knowledge required to be an intelligent map user. It is also designed to prepare students for further studies in geography, cartography, and geospatial technologies. Topics include map making and coordinate systems, issues regarding map scale and projections, navigation and way finding using maps, techniques of thematic mapping, introductions to remote sensing and geographic information systems, emerging mapping technologies and applications, and using internet mapping services.

GEO 200: The Ocean World

Credits: 3
Type: LEC

Introduces oceanography and its relationship to environmental, economic, and strategic aspects. Considers the impact of humans on the ecological balance among the oceans, continents, atmosphere, and living things, as well as ports, ships and maritime

law.

GEO 201: Disasters: a Study of Hazards

Credits: 3
Type: LEC

Studies natural and human-induced disasters; such as storms, earthquakes, floods, fires, chemical pollution, and impact of war on the physical and social environment. Investigates risk taking, human reaction to disasters, and health-related studies of hazards. Utilizes case studies, slides, and films.

GEO 211: Univariate Statistics in Geography

Credits: 4
Type: LEC/LAB

Introduces probability as a measure of uncertainty. Addresses the use of such measures of uncertainty for describing data, and for making inferences about large populations from small samples. These descriptive and inferential aspects of statistics are illustrated using geographic examples from a wide variety of different fields.

GEO 231: U.S. Contemporary Problems

Credits: 3
Type: LEC

Examines spatial structures and growth processes involving contemporary spatial dynamics of the American socioeconomic systems.

GEO 281: Web-Based Geographic Information Systems

Credits: 3
Type: LEC

Recent Advances in internet technology have stimulated rapid development of on-line imaging and mapping systems. This course provides a systematic introduction to these internet-based digital imaging and mapping systems in order to familiarize students with Internet-based tools and data and allow them to explore and understand the spatial distribution of natural and constructed phenomena. Through a combination of lectures and exercises, students will develop and practice the following on-line skills: using interface of on-line systems, digital map display in 2D and 3D, digital image display in 2D and 3D, flight simulation, multiple image and map management, measurements, navigation, spatial query, feature selection and buffering, and customized map making.

GEO 330: Dynamics of International Business

Credits: 3
Semester(s): Fall
Type: LEC

Examines the rapidly changing dynamics of the international business environment and its impact on corporate strategies and patterns of international trade, investment and development. Covers the political, legal, technological and cultural underpinnings of the global economy. Provides students with a solid foundation for conducting international business research and making sense of current events.

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GEO 333: Bases of World Commerce

Credits: 3
Semester(s): Spring
Type: LEC

Involves a theoretical and empirical study of the spatial aspects of commodity flows among countries and regions; also examines conditions leading to trade, and to barriers to the movement of goods.

GEO 334: International Environments and Commercial Problems

Credits: 3
Semester(s): Fall, Spring
Type: LEC

Introduces students to the interconnections among culture, social expectations, and international business. Covers cross-cultural communication and negotiation, cross-cultural management and alliance formation, and corporate social and environmental responsibility. The course is designed to challenge students to understand difference and to overcome stereotypes in thinking about the operation of business in different parts of the world.

GEO 345: Water Resources

Credits: 3
Semester(s): Spring
Pre-requisites: [GEO 101](#) Or [GLY 101](#)
Type: LEC

Examines the occurrence, use, management, and conservation of water and water resources in the U.S. and around the world. The course further discusses the environmental, economic, and social implications of floods, droughts, dams, water usage, and waste water, as well as current issues in water quality, water pollution, and water resource regulation.

GEO 347: Climatic Geomorphology

Credits: 3
Semester(s): Spring
Pre-requisites: [GEO 101](#) Or [GLY 101](#)
Type: LEC

Introduces land-forming processes at work on the Earth's surface, including water, wind, waves and ice. Emphasizes the roles of climate and human impact on earth surface processes, and it considers the hazardous consequences of these processes, such as flooding, landslides, and coastal erosion.

GEO 348: Landform Development

Credits: 3
Semester(s): Fall
Type: LEC

Studies plate tectonics, structure, volcanism, minerals, rocks, weathering, slope development, and fluvial and coastal geomorphology.

GEO 350: Landform Field and Laboratory Techniques

Credits: 4
Semester(s): Fall
Pre-requisites: [GEO 101](#) Or [GLY 101](#)
Type: LEC

Introduces data collection techniques in Earth Systems Science. Students will actively participate in the collection and analysis of data using a wide range of field and laboratory equipment, with all activities linked to relevant environmental and geomorphic issues. Students will develop and enhance their skills in data collection, reduction, and analysis, analytical thinking, scientific writing, and the preparation of professional reports.

GEO 352: Introduction to Soils

Credits: 3
Semester(s): Spring
Pre-requisites: [GEO 101](#) Or [GLY 101](#)
Type: LEC

Introduces the concepts of soil science, composition and classification of soils, and the spatial distribution of major soil categories. Analyzes soil properties, soil/plant relationships, nutrients, land management practices, and ecological and engineering problems.

GEO 356: Forest Ecology

Credits: 3
Semester(s): Fall
Pre-requisites: [BIO 200](#) Or [GEO 101](#) Or [SSC 118](#)
Type: LEC

Explores forests in terms of their diverse structure, composition, and function. Examines factors that control growth of individual trees, development of forest stands, and dynamics of forest landscapes. Field trips and lab work develop the ability to recognize and reconstruct forest history, using a combination of forest structure and tree-ring analysis.

GEO 366: Urban Systems Geography

Credits: 3
Semester(s): Fall
Type: LEC

Provides an introduction to the knowledge areas of urban systems and structure, and a brief overview of fundamentals and general information that one needs to build upon in order to become a professional urban geographer. The course examines the formation and growth dynamics of cities, interprets the mechanism under which the urban space functions, and observes the industrial, residential, migratory, environmental, planning and transportation aspects of urban society.

GEO 367: Urban Social Geography

Credits: 3
Semester(s): Spring
Type: LEC

Examines human activities central to the internal working of cities in the context of globalization, fragmentation, and difference. Students

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will consider theories about how society and space mutually condition each other in processes of social stratification and discrimination that foster class, race, gender, and other differences and cause their expression on the urban landscape.

GEO 381: Cartography

Credits: 4
Semester(s): Spring
Pre-requisites: [GEO 120](#)
Type: LEC/LAB

Introduces fundamentals of computer cartography, which is the study and practice of making map representations of the Earth. Provides practical training in the techniques for the representation, manipulation and display of spatial data using computer software.

GEO 389: Business Geographics

Credits: 3
Semester(s): Fall
Pre-requisites: [GEO 103](#) Or [GEO 120](#)
Type: LEC/LAB

Explores the application of GIS in business. Storage and spatial referencing of data are two processes that need to be carried out to make any business successful. GIS can help not only in these tasks, but also in identification of patterns and relationships that can save companies money and increase profit.

GEO 411: Multivariate Statistics in Geography

Credits: 3
Semester(s): Spring
Pre-requisites: [GEO 410](#)
Type: LEC

Provides an introduction to techniques of multivariate analysis. Topics include ANOVA, simple regression, multiple regression, logistic regression, principal components analysis, and cluster analysis.

GEO 412: Geography of Health

Credits: 3
Type: LEC

Studies human disease and health from an ecological perspective. Students gain an appreciation for the geographic variation in the rates of both infectious and chronic diseases. The effect of the environment will be examined in terms of population density, climate, socio-economic conditions, political situation, mobility, urbanization, pollution, cultural practices, and access to health care.

GEO 418: Population Geography

Credits: 3
Type: LEC

Examines recent trends in population redistribution in the United States. Considers methods for producing population estimates and forecasts, and explores application of population analysis to the planning problems of government and business.

GEO 419: Transportation and Society

Credits: 1
Semester(s): Spring
Pre-requisites: [GEO 102](#) Or [GEO 103](#) Or [GEO 410](#)
Type: LAB

Studies evolution of the U.S. transportation system. Examines contemporary transportation problems; including provision of transportation, transport networks, transport flows, urban transportation, logistics, and information technologies. Also considers transport and urban forms.

GEO 420: Transportation and Spatial Information

Credits: 3
Semester(s): Spring
Type: LEC/LAB

Overview of data used in transportation, including travel behavior surveys, vehicle locations, and traffic information. The course also covers GIS and Transportation (GIS-T) data models, data accuracy, primary and secondary data collection and storage approaches, geo-processing of network data, principles of Intelligent Transportation Systems, and location-based services.

GEO 425: Industrial/Business Geography

Credits: 3
Semester(s): Spring
Pre-requisites: [GEO 330](#) Or [GEO 333](#) Or [GEO 334](#)
Type: LEC

Industry dynamics and regional change in a globalized world. In understanding the relationship between the firm and the region, the activities of other agents of regional development (e.g., universities, government, non-government sectors, labor markets) will also be taken into consideration.

GEO 426: Senior Geography Seminar

Credits: 3
Semester(s): Fall, Spring
Type: SEM

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.

Topics vary each semester.

GEO 430: Applied Urban Geography

Credits: 3
Type: LEC/LAB

Explores spatial structure of urban and metropolitan areas. Topics include (1) the changing form of urban areas over time, (2) the behavior of people that gives rise to particular urban forms, (3) the ways in which the internal structure of cities affects individual and group behavior and welfare, and (4) the various ways in which people perceive and interact with their environment. The lab provides students the opportunity to analyze basic data, using cartographic and statistical modes of analysis and the resources of the Geographical Information and Analysis Lab (GIAL). Students in the lab must take the lecture portion concurrently; however,

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students in the lecture may elect not to take the lab for additional credit.

GEO 435: Conservation Biogeography

Credits: 3

Semester(s): Spring

Pre-requisites: [BIO 309](#) Or [GEO 356](#) Or [SSC 315](#)

Type: LEC

Examines components of biodiversity: what it is, why we like it, where it is highest, and what threatens it. Focuses on the application of spatial solutions to biodiversity maintenance in wildlands, and to biodiversity management in working landscapes (especially logged but also farmed). Case studies and a field trip are employed to explore the usefulness of the methods.

GEO 444: Advanced Earth System Science

Credits: 3

Semester(s): Spring

Type: LEC

Presents and discusses concepts, theories and applications in Earth System Science investigating the complexity of physical, chemical, and biological processes in the geosphere, atmosphere, hydrosphere, biosphere, and ecosphere. Fundamental understanding of the Earth system includes emphasizing these dynamic processes and their interaction that extend over a wide range of spatial and temporal scales. The lecture aims to create an interdisciplinary learning environment that supports understanding and communicating with other disciplines about the complex environmental processes. Possible impact and solutions to local, regional, and global environmental problems are assessed through modeling scenarios of changes in biogeochemical cycles.

GEO 445: Restoration Ecology

Credits: 3

Semester(s): Spring

Pre-requisites: [GEO 356](#)

Type: LEC

Restoration ecology is the art and science of repairing lands that have become damaged by natural or human disturbance. Examines ecological and social reasons for restoration. Focuses on how to identify and repair the key physical, chemical and biotic components of damaged ecosystems. Case studies and a field trip help are used to develop the theories and methods.

GEO 448: Stream Restoration

Credits: 3

Pre-requisites: [GEO 345](#) Or [GEO 347](#) Or [GLY 312](#)

Type: LEC

Examines the scientific basis for stream restoration programs in the U.S. and worldwide through a consideration of interdisciplinary themes and practices. Participants will actively discuss river processes, aquatic ecology, restoration needs and goals, restoration approaches, ecological economics, and the uncertainty and sustainability of restoration designs. Students are exposed to a variety of stream restoration concepts through lectures, seminars, and independent projects.

GEO 449: Fluvial Geomorphology

Credits: 3

Semester(s): Spring

Pre-requisites: [GEO 345](#) Or [GEO 347](#) Or [GLY 312](#)

Type: LEC

Examines the origin, geometry, water flow, and sediment transport associated with streams and rivers, and how these processes and forms vary in time and space. Places particular emphasis on the analytic description of physical processes, the adjustment of rivers to natural and human-induced disturbances, the interactions between fluvial processes, water quality and aquatic habitat, and emerging areas of research.

GEO 451: Special Topics in Cartography

Credits: 3

Type: SEM

Advanced seminar. Topics vary each semester. Requires independent projects in the field being covered.

GEO 454: Soils Laboratory Methods

Credits: 3

Type: LEC/LAB

Studies soils laboratory techniques; involves field work (soil sampling) and soil surveying.

GEO 460: Geography of Development

Credits: 3

Semester(s): Fall

Pre-requisites: [GEO 103](#) Or [GEO 330](#) Or [GEO 333](#)

Type: LEC

Examines how regions, cities, and countries are engaged in economic, political, and institutional strategies in order to tackle problems related to poverty, underdevelopment, economic decline, and/or economic stagnation. Attention is given to the influences of local and global forces, actors, and policies on regional and national competition and development.

GEO 462: Network and Location Analysis

Credits: 3

Semester(s): Spring

Type: LEC/LAB

Examines the basic theories and concepts behind transportation networks, their structure and operation as well as their need in different applications such as location theory. Approaches topics from both a theoretical and a GIS perspective. There will be a weekly laboratory to provide hands-on experience in the different topics.

GEO 464: Mobility and Flows

Credits: 3

Semester(s): Fall

Type: LEC/LAB

Geography

Studies the human decision-making process underlying spatial mobility that results in the creation of patterns and daily routines. Covers the different environments and theories involved in the process, as well as the modeling techniques that have been used, emphasizing the application of Geographic Information Systems.

GEO 470: Integrated Environmental Management

Credits: 3

Pre-requisites: [GEO 101](#) Or [GLY 101](#)

Type: LEC

Introduces an integrated framework for natural resource management that addresses biophysical, social, and economic issues affecting natural resources such as water, soil, air, plant and animal communities and their use through agriculture, forestry, and fishery. The multidisciplinary approach equips the participants with the necessary tools and techniques to develop sound management policy and practice at the watershed scale from small watersheds to large basins. Outlines methods for problem definition and goal setting to elect appropriate and effective management strategies and procedures for monitoring and implementation.

GEO 475: Landscape Modeling With GIS

Credits: 3

Semester(s): Fall

Pre-requisites: [GEO 481](#)

Type: LEC

Utilizes concepts and software tools to appropriately analyze geo-spatial data and model environmental processes. The course uses exercises related to physical processes, but also presents and discusses methods and examples in the fields of environmental science, ecology and human geography.

GEO 479: GIS and Environmental Modeling

Credits: 3

Semester(s): Spring

Pre-requisites: [GEO 481](#)

Type: LEC/LAB

Emphasizes GIS applications for environmental modeling, which is loosely defined as any study that contains an environmental element. This is an intermediate level GIS course. GIS methodology design is the primary focus of the lectures and the following topics are discussed: basic GIS methods, using statistics to test and validate GIS methods, and integrating GIS with environmental models. Case studies are used to support the discussion of method design and help students select appropriate GIS methods for a project. The hands-on laboratory exercises focus on learning advanced GIS methods in order to help students implement a GIS project of their interest.

GEO 481: Geographic Information Systems

Credits: 1

Semester(s): Fall, Spring

Type: LAB

Provides a general introduction to the principles and applications of geographic information systems (GIS). The lectures cover several fundamental aspects of GIS: (1) the basics of a GIS system, (2) GIS data and sources of data, (3) GIS analysis functions, and (4) GIS

applications and related issues. The laboratory exercises are based on the leading GIS software, ArcGIS, and are designed to help students understand the lecture materials and gain hands-on experiences in GIS data acquisition, spatial database management, spatial analysis, and mapping.

GEO 482: Locational Analysis

Credits: 3

Pre-requisites: [GEO 120](#)

Type: LEC

Surveys the basic types of geographic location problems encountered in the real world and examines basic techniques applied to solve those problems.

GEO 483: Remote Sensing

Credits: 4

Type: LEC/LAB

Introduces the principles and applications of remote sensing, and the basic techniques of digital image processing. The lectures introduce a number of fundamental topics of remote sensing: the interaction between energy and Earth surface, major sensor systems and images, basic techniques for image enhancement and image classification, classification accuracy assessment, and applications of remote sensing. The laboratory exercises are designed to help students understand and gain hands-on experiences in digital image process techniques introduced in the lectures.

GEO 484: GIS Applications

Credits: 3

Type: LEC

Explores capabilities for micro- and minicomputer applications of geographic information systems, including such topics as data volumes, data partitioning, and database construction and maintenance. Explores applications to urban-planning and natural-resource management using ARC/INFO.

GEO 485: Cartography and Geographic Visualization

Credits: 3

Pre-requisites: [GEO 120](#) Or [GEO 381](#)

Type: LEC/REC

Provides an overview of cartographic design and visualization within the context of GIS and multi-media web presentation to enhance the visualization skills expected of a modern geographer. The course will cover both theoretical and practical issues associated with visual representation, cartographic design process, exploratory data analysis, data uncertainty, quality and generalization, thematic mapping, web designing, online mapping and other multi-media applications.

GEO 486: Spatial Decision-Support Systems

Credits: 3

Type: LEC

Adds the spatial element to decision-support systems by integrating

Geography

analytic modeling and GIS. Also considers issues in system design and implementation.

GEO 487: Thematic Cartography

Credits: 4
Semester(s): Spring
Type: LEC

Applies formal principles of graphic design with skills of computer and manual cartographic production. Introduces principles and skills of computer-assisted cartographic production, and of photographic and digital-enhancement techniques that may be incorporated in the map production process.

GEO 488: GIS Design

Credits: 3
Semester(s): Spring
Type: SEM/LAB

Emphasizes problems and methods for defining GIS user needs and the development cycle. Adapts methods and software engineering to the GIS planning process. Topics include product identification, data sources, system selection, and implementation scheduling.

GEO 489: GIS Algorithms and Data Structures

Credits: 3
Semester(s): Spring
Type: LEC/LAB

Examines the data models for geographic information systems. Student programming projects emphasize alternative methods of implementing common GIS operations.

GEO 493: Dynamic Modeling of Human and Environmental Systems

Credits: 3
Type: LEC

This course will provide hands-on experience in the construction and simulation of dynamic models to represent human and environmental systems. The paradigm case of such systems is diffusion over space and time: diffusion of ideas by word of mouth, diffusion of diseases by contact between individuals, and diffusion of forest fires and invasive species across landscapes. A range of modeling paradigms will be covered, from continuous representations of system dynamics to discrete interactions of individual/agent-based models. Calculus and programming experience are helpful but not required. Exercises and readings will be provided from a variety of sources reflecting current challenges that practitioners face in the multi-disciplinary field of dynamic modeling.

GEO 496: Geographic Internship

Credits: 3
Semester(s): Fall
Type: TUT

The content of this course is variable and therefore it is repeatable

for credit. The [University Grade Repeat Policy](#) does not apply.

For advanced students. Involves a work opportunity in a local governmental agency or firm. See the director of undergraduate studies for more information.

GEO 497: Geography Honors Program

Credits: 1-4
Type: TUT

Students who have completed at least 96 credit hours and who have a minimum GPA of 3.5 in geography and overall are eligible to participate in the honors program. See the Director of Undergraduate Studies for more information.

GEO 499: Independent Study

Credits: 1-4
Semester(s): Fall, Spring
Type: TUT

The content of this course is variable and therefore it is repeatable for credit. The [University Grade Repeat Policy](#) does not apply.