Geographical and Sustainability Sciences

Chair
- David A. Bennett

Director, undergraduate studies
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Undergraduate major: geography (B.A., B.S.)
Undergraduate minors: geographic information science; geography
Graduate degrees: M.A. in geography; Ph.D. in geography
Faculty: http://clas.uiowa.edu/geography/people/faculty
Web site: http://clas.uiowa.edu/geography/

Geographical and sustainability sciences are concerned with place, environment, and the ongoing processes of change within and between social and physical systems. Geographical and sustainability sciences’ importance to scholarly inquiry is rooted in the complexity of social and environmental problems. Three concepts at the core of the disciplines—space, place, and scale—provide theoretical constructs and methodological tools for sciences that investigate the complex character of social and environmental phenomena.

Geographical and sustainability scientists examine issues such as distribution and consumption of natural resources, air and water quality, climate changes and ecosystem dynamics, growth and development of urban areas, population dynamics, politics and practice of international development, and social justice. They view society and the environment as a physical/social/cultural system. They apply uniquely geographical and sustainability perspectives and tools, as well as knowledge from other social and scientific disciplines, to analyze the emergent properties of these systems.

Department of Geographical and Sustainability Sciences graduates find employment opportunities in government, nongovernmental organizations, and business. For example, many geographical and sustainability scientists are employed in resource management, urban and regional development, public health, and market area analysis. They analyze problems in the distribution and interactions among physical, ecological, social, and political systems.

Geographical and sustainability sciences students acquire skills in computer-based cartography and geographic information systems (GIS) software used to investigate and solve many environmental and social problems. Opportunities for graduates with GIS training are growing rapidly in both private and governmental organizations.

The geographical and sustainability sciences faculty has developed an undergraduate instructional program that serves students majoring or minor in geography as well as students in other disciplines. Courses in geography are commonly required for students preparing to teach at the elementary and secondary school levels and for those who want to pursue careers in urban and regional planning. They also provide a background for many related professions, including law, health care, environmental or transportation engineering, and international business.

Geographical and sustainability sciences students use the University’s Geographical Information Systems Instructional Lab (GISIL) for GIS instruction and research. The lab is located in the department; see “Facilities and Resources” later in this Catalog section.

The Department of Geographical and Sustainability Sciences participates in a number of University of Iowa interdisciplinary programs that have international, area studies, urban, or environmental components, including an interdisciplinary undergraduate major, which it administers; see Environmental Policy and Planning in the Catalog. The Department of Geographical and Sustainability collaborates with other departments to offer the Certificates in Social Science Analytics and in Wind Energy. It also participates in the University's internship program for students; see “Internships” later in this Catalog section.

Undergraduate Programs of Study
- Major in geography (Bachelor of Arts, Bachelor of Science)
- Minor in geographic information science
- Minor in geography

Bachelor of Arts, Bachelor of Science

The Bachelor of Arts with a major in geography requires a minimum of 120 s.h., including at least 38-43 s.h. of work for the major. The Bachelor of Science with a major in geography requires a minimum of 120 s.h., including at least 44-50 s.h. of work for the major. Credit required for the major depends on the student’s choice of track. Students must maintain a g.p.a. of at least 2.00 in all courses for the major and in all UI courses for the major. They also must complete the College of Liberal Arts and Sciences General Education Program. Transfer students majoring in geography must earn a minimum of 15 s.h. for the major in residence at the University of Iowa.

Students majoring in geography may not earn the minor in geographic information science.

The major in geography (either B.A. or B.S.) is appropriate preparation for advanced training or careers in geographical and sustainability sciences. Students with strong interest in quantitative analysis and model building should pursue the Bachelor of Science and are encouraged to master an appropriate computer programming language.

Students choose one of three tracks in the major: environmental studies, geographic information science (GISci), or health and society. All students majoring in geography complete a common set of foundation courses in addition to the requirements for their choice of track. Bachelor of Science students take additional mathematics course work.

Consistent with the College of Liberal Arts and Sciences maximum semester hours rule, students may count a
maximum of 56 s.h. earned in their major department toward graduation.

The major in geography requires the following work.

**Common Requirements (B.A. and B.S.)**

All geography majors must complete the following courses. Students may not use a course to fulfill more than one major requirement.

One of these:

- GEOG:1010 Introduction to Human Geography 3 s.h.
- GEOG:1090 Globalization and Geographic Diversity 3 s.h.

All of these:

- GEOG:1020 The Global Environment 3 s.h.
- GEOG:1021 The Global Environment Lab 1 s.h.
- GEOG:1050 Foundations of GIS 3 s.h.

One of these, in addition to any course required to fulfill a track requirement:

- GEOG:1060 Geography of Asia: From Japan to Pakistan 3 s.h.
- GEOG:1070 Contemporary Environmental Issues 3 s.h.
- GEOG:1090 Globalization and Geographic Diversity (if not chosen above) 3 s.h.
- GEOG:2110 Population Geography: Societies in Flux 3 s.h.
- GEOG:2130 World Cities 3 s.h.
- GEOG:2910 The Global Economy 3 s.h.
- GEOG:2950 Environmental Conservation 3 s.h.

One of these (not required for GISci track students):

- GEOG:3340 Ecosystem Services: Human Dependence on Natural Systems 3 s.h.
- GEOG:3500 Introduction to Environmental Remote Sensing 3 s.h.
- GEOG:3520 GIS for Environmental Studies 3 s.h.
- GEOG:3540 Introduction to Geographic Visualization 3 s.h.
- GEOG:3560 Spatial Analyses of Wind Energy 3 s.h.
- GEOG:3570 Light Detection and Ranging (LiDAR): Principles and Applications 3 s.h.
- GEOG:4010 Field Methods in Physical Geography 3 s.h.
- GEOG:4020 Field Methods: Mapping and Mobile Computing 3 s.h.
- GEOG:4150 Health and Environment: GIS Applications 3 s.h.
- GEOG:4650 Simulation in Environmental Geography 3 s.h.
- GEOG:5129 Information Systems for Resource Management 3 s.h.

One of these:

- GEOG:4030 Senior Project Seminar 3 s.h.
- GEOG:4995 Honors Thesis (must enroll for 3 s.h.)

Senior Project Seminar [GEOG:4030] is offered only in spring semesters. Students who choose GEOG:4995 Honors Thesis must make arrangements with a faculty advisor.

One of these (at least 1 s.h. required):

- GEOG:3400 Iowa Environmental Policy in Practice 3 s.h.
- GEOG:3992 Undergraduate Research (including through ICIGO or independent research) arr.

The Department of Geographical and Sustainability Sciences is a participant in the University's internship program, which provides opportunities for both undergraduate and graduate students to participate in paid and unpaid activities related to their academic programs. The Pomerantz Career Center works with students to develop appropriate internships.

**STATISTICS COURSES (B.A.)**

Bachelor of Arts students must earn a minimum of 3 s.h. in statistics by completing one of the following courses or a statistics course equivalent to or numbered above one of these.

- GEOG:1065 Introduction to Spatial Analysis: Patterns and Processes 3 s.h.
- PSQF:4143/STAT:4143 Introduction to Statistical Methods 3 s.h.
- STAT:1020/PSQF:1020 Elementary Statistics and Inference 3 s.h.
- STAT:2010 Statistical Methods and Computing 3 s.h.
- STAT:3510 Biostatistics 3 s.h.

**STATISTICS/MATHEMATICS COURSES (B.S.)**

Bachelor of Science students must earn a minimum of 9 s.h. in statistics/mathematics by completing one of the following options or courses equivalent to or numbered above these.

**Option 1**

This sequence:

- PSQF:4143/STAT:4143 Introduction to Statistical Methods 3 s.h.
- PSQF:6243/STAT:6513 Intermediate Statistical Methods 4 s.h.

Or this sequence:

- BIOS:5110 Introduction to Biostatistics 3 s.h.
- BIOS:5120 Design and Analysis of Biomedical Studies 3 s.h.

Or this sequence:

- STAT:2010 Statistical Methods and Computing 3 s.h.
- STAT:3200 Applied Linear Regression 3 s.h.

And one of these:

- EES:4870 Applied Geostatistics 3 s.h.
- MATH:1380 Calculus and Matrix Algebra for Business 4 s.h.
- MATH:1460 Calculus for the Biological Sciences 4 s.h.
MATH:1550 Engineering Mathematics I: Single Variable Calculus 4 s.h.
MATH:1850 Calculus I 4 s.h.

Option 2
One of these:
PSQF:4143/STAT:4143 Introduction to Statistical Methods 3 s.h.
STAT:2010 Statistical Methods and Computing 3 s.h.

And one of these sequences:
MATH:1440 & MATH:1460 Mathematics for the Biological Sciences - Calculus for the Biological Sciences 8 s.h.
MATH:1850 & MATH:1860 Calculus I-II 8 s.h.

Tracks (B.A. and B.S.)
All geography majors must complete one of the three tracks described below: environmental studies, geographic information science (GISci), or health and society. Students should pay close attention to prerequisites for the upper-level courses in each track in order to develop a study plan that allows them to complete their major in a timely way.

Students in the environmental studies or health and society track who wish to gain additional experience in theory and application of GIS systems should take GIS-based courses offered by the Department of Geographical and Sustainability Sciences, as described for each track below.

Students may use GEOG:3001 Special Topics to fulfill a track requirement if the course content is applicable.

ENVIRONMENTAL STUDIES TRACK
The environmental studies track requires a minimum of 15 s.h. It is designed for students interested in the interrelationships among social and natural processes that affect the environment. The track prepares students for careers or pursuit of personal interests in resource management, landscape ecology, water resources, environmental policy or law, global environmental change, sustainable development, or other complex environmental issues. Graduates may find employment in an environmental profession such as conservation, environmental planning and regulation; or environmental law, policy, and politics.

The environmental studies track offers training in field observation, remote sensing, geographical information systems, quantitative analysis/computing, and cartographic representation. It also provides a sound foundation for graduate or professional-level studies in the natural or social aspects of the environment.

In addition to satisfying the common requirements for all geography majors, students in the environmental studies track complete a common track course (3 s.h.) and at least 12 s.h. of upper-level geographical and sustainability sciences courses.

Common course—all environmental studies track students take this:
GEOG:1070 Contemporary Environmental Issues 3 s.h.

Students choose a total of four upper-level courses (at least 12 s.h.) from the following lists, in consultation with their advisors. Those who wish to gain additional experience in theory and application of GIS systems should take GEOG:3520 GIS for Environmental Studies and GEOG:4520 GIS for Environmental Studies: Applications, or they should earn 6 s.h. in other GIS-based geographical and sustainability sciences courses.

At least one of these:
GEOG:2310 Introduction to Climatology 3 s.h.
GEOG:2374 Biogeography 3 s.h.
GEOG:2410 Environment and Development 3 s.h.
GEOG:2930 Water Resources 3 s.h.
GEOG:3500 Introduction to Environmental Remote Sensing 3 s.h.
GEOG:3520 GIS for Environmental Studies 3 s.h.

At least one of these:
GEOG:3210 Health, Work, and the Environment 3 s.h.
GEOG:3310 Landscape Ecology 3 s.h.
GEOG:3320 Wetlands: Function, Geography, and Management 3 s.h.
GEOG:3340 Ecosystem Services: Human Dependence on Natural Systems 3 s.h.
GEOG:3350 Urban Ecology 3 s.h.
GEOG:3400 Iowa Environmental Policy in Practice 3 s.h.
GEOG:3560 Spatial Analyses of Wind Energy 3 s.h.
GEOG:3750 Environmental Quality: Science, Technology, and Policy 3 s.h.
GEOG:3760 Hazards and Society 3 s.h.
GEOG:3920 Planning Livable Cities 3 s.h.
GEOG:4010 Field Methods in Physical Geography 3 s.h.
GEOG:4500 Applications in Environmental Remote Sensing 4 s.h.
GEOG:4520 GIS for Environmental Studies: Applications 3 s.h.
GEOG:4650 Simulation in Environmental Geography 3 s.h.
GEOG:4750 Environmental Impact Analysis 4 s.h.
GEOG:4770 Environmental Justice 3 s.h.

GEOGRAPHIC INFORMATION SCIENCE TRACK
The geographic information science track (GISci) requires a minimum of 18-19 s.h. It is designed for students preparing for positions in government agencies, nongovernment organizations, international development agencies, and business. It also provides preparation for graduate study in geography, planning, and other disciplines. The track focuses on the design, implementation, and use of geographic information systems. Courses address how geographic data are acquired, stored, accessed, displayed, managed, and analyzed.

Students in the geographic information science track learn to address problems involved in modeling environmental systems, identifying the best locations for service facilities,
assessing environmental impacts, and forecasting the populations of small areas. They use the department’s Geographical Information Systems Instructional Lab (GISIL) extensively to develop expertise in using GIS software.

Course work in the track covers methods of spatial analysis and geographical modeling and involves database management and computer programming.

In addition to the common requirements for all geography majors, students in the geographic information science track complete a common track course (3-4 s.h.) and at least 15 s.h. of upper-level geographical and sustainability sciences courses.

Common course—all GISci track students take one of these:
- CS:1110 Introduction to Computer Science 3 s.h.
- CS:1210 Computer Science I: Fundamentals 4 s.h.
- CS:2110 Programming for Informatics 4 s.h.

Students choose a total of five upper-level courses (at least 15 s.h.) from the following lists in consultation with their advisors (at least one course from each list). GISci track students are encouraged to add breadth to their degree by taking additional upper-level courses in the department. Students interested in the application of GIS to environmental issues should select additional courses from the department's environmental studies area; those interested in health or other socioeconomic issues should select additional courses from the department's health and society area.

At least one of these:
- GEOG:3500 Introduction to Environmental Remote Sensing 3 s.h.
- GEOG:3520 GIS for Environmental Studies 3 s.h.
- GEOG:3530 Mapping American Cities and Regions 3 s.h.
- GEOG:3540 Introduction to Geographic Visualization 3 s.h.
- GEOG:4650 Simulation in Environmental Geography 3 s.h.

At least one of these:
- GEOG:4500 Applications in Environmental Remote Sensing 4 s.h.
- GEOG:4520 GIS for Environmental Studies: Applications 3 s.h.
- GEOG:4570 Spatial Analysis and Location Models 3 s.h.
- GEOG:4580 Introduction to Geographic Databases 3 s.h.

At least one of these:
- GEOG:3340 Ecosystem Services: Human Dependence on Natural Systems 3 s.h.
- GEOG:3560 Spatial Analyses of Wind Energy 3 s.h.
- GEOG:3760 Hazards and Society 3 s.h.
- GEOG:4010 Field Methods in Physical Geography 3 s.h.
- GEOG:4020 Field Methods: Mapping and Mobile Computing 3 s.h.
- GEOG:4150 Health and Environment: GIS Applications 3 s.h.

HEALTH AND SOCIETY TRACK

The health and society track requires a minimum of 15 s.h. It is designed for students interested in understanding the causes and consequences of social inequalities, the long-term effects that changing human/environmental interactions have on human health, and emerging transnational challenges to the sustainability of livelihoods. The track provides students with foundational knowledge and skills to support postgraduate employment in governmental or nongovernmental positions, graduate study in public health or in health-related fields, and service experiences such as the Peace Corps and AmeriCorps.

Students in the health and society track gain understanding of the factors and processes that determine geographic patterns of health. They explore the effects of the social, built, and natural environments on the physical, social, and mental health of populations. Course work in the track examines patterns and causes of infectious and chronic diseases; hazards, vulnerability, and environmental justice; and the spatial methods used to understand such issues.

Thematic content from courses is complemented by quantitative spatial and statistical analysis course work, enabling students to analyze and understand geographic patterns of health. Students have opportunities to work on applied problems, such as assessing patterns of disease, identifying the underlying population and environmental drivers of good or poor health, and evaluating the social dimensions of environmental impacts.

In addition to satisfying the common requirements for all geography majors, students in the health and society track complete three common track courses (9 s.h.) and at least two upper-level geographical and sustainability sciences courses (6 s.h.).

Common courses—all health and society track students take these:
- GEOG:2110 Population Geography: Societies in Flux 3 s.h.
- GEOG:3110 Geography of Health 3 s.h.
- GEOG:4150 Health and Environment: GIS Applications 3 s.h.

Students choose two upper-level courses (at least 6 s.h.) from the following list, in consultation with their advisors. Those who wish to gain additional experience in theory and application of GIS systems should also take an additional 6 s.h. in GIS-based geographical and sustainability sciences courses.

At least two of these:
- GEOG:3070 Hungry Planet: Global Geographies of Food 3 s.h.
- GEOG:3210 Health, Work, and the Environment 3 s.h.
- GEOG:3760 Hazards and Society 3 s.h.
- GEOG:3920 Planning Livable Cities 3 s.h.
- GEOG:4770 Environmental Justice 3 s.h.

B.A. or B.S. with Teacher Licensure

Geography majors interested in earning licensure to teach in elementary and/or secondary schools must complete
the College of Education's Teacher Education Program (TEP) in addition to the requirements for the major and all requirements for graduation. The TEP requires several College of Education courses and student teaching. Contact the Office of Education Services for details.
Students must satisfy all degree requirements and complete Teacher Education Program licensure before degree conferral.

Four-Year Graduation Plan

The following checkpoints list the minimum requirements students must complete by certain semesters in order to stay on the University's Four-Year Graduation Plan. (Courses in the major are those required to complete the major; they may be offered by departments other than the major department.)

Bachelor of Arts
Before the third semester begins: one introductory course in the major
Before the fifth semester begins: five courses in the major
Before the seventh semester begins: 11 courses in the major and at least 90 s.h. earned toward the degree
Before the eighth semester begins: 14 courses in the major
During the eighth semester: enrollment in all remaining course work in the major, all remaining General Education courses, and a sufficient number of semester hours to graduate

Bachelor of Science
Before the third semester begins: two introductory courses in the major
Before the fifth semester begins: six courses in the major
Before the seventh semester begins: 12 courses in the major and at least 90 s.h. earned toward the degree
Before the eighth semester begins: 15 courses in the major
During the eighth semester: enrollment in all remaining course work in the major, all remaining General Education courses, and a sufficient number of semester hours to graduate

Honors in the Major

Students majoring in geography have the opportunity to graduate with honors in the major. Departmental honors students must maintain a cumulative University of Iowa g.p.a. of at least 3.33 and a g.p.a. of at least 3.33 in all work for the major. They must be admitted to the department's honors program by the first semester of their senior year or earlier.

Honors students in geography pursue study beyond the typical undergraduate level. In order to graduate with honors in the major, they work under the direction of a faculty member to conduct original research and then prepare and present an honors thesis based on their research. The thesis is reviewed by a committee of at least three faculty members. Departmental honors students earn credit for their thesis by registering for GEOG:4995 Honors Thesis. They may substitute GEOG:4030 Senior Project Seminar for GEOG:4995, as long as they continue to work on the thesis under the direction of a faculty member.

In addition to honors in their majors, undergraduate students have a variety of opportunities for honors study and activities through membership in the University of Iowa Honors Program; visit Honors at Iowa to learn about the University's honors program.

Minor: Geographic Information Science

The minor in geographic information science requires a minimum of 15 s.h. in geographical and sustainability sciences courses, including 12 s.h. in University of Iowa courses numbered 3000 or above. Students must maintain a g.p.a. of at least 2.00 in all courses for the minor and in all UI courses for the minor. Course work in the minor may not be taken pass/nonpass.

Students majoring in geography may not earn the minor in geographic information science.

Geographic Information Science is the study of geography using digital technology. The field uses geographic information systems (computer-based technologies designed to facilitate the capture, organization, analysis, and display of geographic data), remote sensing (primarily interpretation of satellite imagery), and spatial modeling (viewing, analyzing, and mapping spatial data) to study geographic patterns and processes and to examine research on the nature, development, and use of these tools.

The minor in geographic information science requires one core course, three mid-level specialization courses, and an advanced course that builds on one of the three mid-level courses. Students should contact the department secretary to request an advisor for help in selecting the advanced course.

Core course—one of these:
GEOG:1050 Foundations of GIS 3 s.h.
GEOG:3010 Geographic Information Systems and Science 3 s.h.

Mid-level specialization courses—all of these:
GEOG:3500 Introduction to Environmental Remote Sensing 3 s.h.
GEOG:3520 GIS for Environmental Studies 3 s.h.
GEOG:3540 Introduction to Geographic Visualization 3 s.h.

Advanced course—one of these:
GEOG:3570 Light Detection and Ranging (LiDAR): Principles and Applications 3 s.h.
GEOG:4020 Field Methods: Mapping and Mobile Computing 3 s.h.
GEOG:4150 Health and Environment: GIS Applications 3 s.h.
GEOG:4500 Applications in Environmental Remote Sensing 4 s.h.
GEOG:4520 GIS for Environmental Studies: Applications 3 s.h.
GEOG:4570 Spatial Analysis and Location Models 3 s.h.
Minor: Geography

The minor in geography requires a minimum of 15 s.h. in geographical and sustainability sciences courses, including 12 s.h. in University of Iowa courses numbered 3000 or above. Students must maintain a g.p.a. of at least 2.00 in all courses for the minor and in all UI courses for the minor. Course work in the minor may not be taken pass/nonpass. Students are encouraged to concentrate their course work in tracks—environmental studies, geographic information science, or health and society (see "Bachelor of Arts, Bachelor of Science" above). For help in selecting courses, students should contact the department secretary to request an advisor for the minor.

Courses for General Education

The Department of Geographical and Sustainability Sciences offers a number of courses that students in other majors may use to satisfy requirements of College of Liberal Arts and Sciences General Education Program. Look for courses with the prefix GEOG under "Natural Sciences," "Social Sciences," and "International and Global Issues" in the General Education Program section of the Catalog.

Nonmajors also may choose geographical and sustainability sciences courses as electives.

Certificate in Social Science Analytics

The Department of Geographical and Sustainability Sciences collaborates with the Departments of Political Science, Sociology, and Statistics and Actuarial Science to offer the undergraduate program in social science analytics; see Social Science Analytics in the Catalog.

Certificate in Wind Energy

The Department of Geographical and Sustainability Sciences (College of Liberal Arts and Sciences) and the Department of Mechanical and Industrial Engineering (College of Engineering) administer the undergraduate certificate program in wind energy; see Wind Energy (College of Engineering) in the Catalog.

Graduate Programs of Study

• Master of Arts in geography
• Doctor of Philosophy in geography

In addition to offering graduate degree programs, the department administers the geoinformatics subprogram of the graduate Certificate in Informatics; see Informatics (Graduate College) in the Catalog.

Department of Geographical and Sustainability Sciences graduate programs focus on investigating the environmental consequences of human decisions on local, regional, and global scales. Central to the department's studies are geographic information science and the theories and models of environmental and social sciences. Within this broad domain, the department is developing strengths in environmental justice, environmental modeling, GIScience and GIS, land use and its environmental consequences, and health geography.

The Master of Arts and Doctor of Philosophy programs prepare students to carry on creative and productive research in selected areas of geography. University of Iowa graduates hold positions on college and university faculties, in private research organizations, and in business and government.

The department provides opportunities for graduate students to gain practical teaching experience through service as departmental teaching assistants or graduate instructors.

Graduate students present research papers at conferences and regularly win awards. Students are involved in faculty research that leads to coauthored publications; they also publish their own papers. Graduate students compete successfully for intramural and extramural funding for graduate education and research.

Master of Arts

The Master of Arts program in geography requires a minimum of 30 s.h. of graduate credit with thesis and 32 s.h. of graduate credit without thesis. The program is designed to be completed in four semesters.

Thesis students must earn 15 s.h. of credit in Department of Geographical and Sustainability Sciences courses numbered 5000 or above; they may count 6 s.h. of thesis credit and 2 s.h. earned in GEOG:7000 Geography Colloquium toward the degree. Students who earn more than 30 s.h. may use the additional work to increase their breadth of knowledge in geography and to tailor their study programs to their individual interests.

Nonthesis students build skills across a range of topics in geographical and sustainability sciences during their first year and develop skills in particular application areas during their second year. Nonthesis students must earn 15 s.h. of credit in Department of Geographical and Sustainability Sciences courses numbered 5000 or above.

M.A. students demonstrate competence by completing appropriate course work; completing and defending an M.A. thesis (for thesis students) or completing a portfolio of finished work and having it reviewed (nonthesis students).

More detailed information about M.A. requirements is provided in the department's Manual for Graduate Degree Requirements; contact the Department of Geographical and Sustainability Sciences.

Doctor of Philosophy

The Doctor of Philosophy program in geography requires 72 s.h. of graduate credit and is designed to be completed in four or five years. The degree prepares students for college and university teaching and for advanced research. It provides study programs that lead to broad knowledge of a field of geography and its literature and to special expertise in a subfield.

Students may enter the Ph.D. program upon completing an undergraduate degree or with advanced standing corresponding to previous graduate education.

All Ph.D. students take the following courses. They take GEOG:7000 Geography Colloquium (1 s.h.) each semester they are in residence.
Applicants and underrepresented minorities are eligible for assistantships are available. In addition, outstanding A number of graduate teaching and research Financial Support

proficiency in spoken English.

in English (TAPE) courses until they have achieved tests are required to take Teaching Assistant Preparation English Language Performance Test (ELPT). Students must be fully certified by the ELPT before they begin their fourth semester in order to be considered for funding in succeeding semesters. Students who do not pass the tests are required to take Teaching Assistant Preparation in English (TAPE) courses until they have achieved proficiency in spoken English.

Doctoral students complete a set of research milestones, including a research paper, an area of concentration bibliography, and a written qualifying examination in the discipline. With the approval of his or her dissertation advisor, each student submits a dissertation proposal to the dissertation committee for critical comments, oral questioning, and approval. Once the dissertation is completed, an oral defense of the dissertation is held.

More detailed information about Ph.D. requirements is provided in the department's Manual for Graduate Degree Requirements; contact the Department of Geographical and Sustainability Sciences.

Admission

Applicants must meet the admission requirements of the Graduate College; see the Manual of Rules and Regulations of the Graduate College.

A bachelor's degree with a major in geography is not required, but applicants must have an undergraduate background relevant to the field. Strength in social science, environmental science, or geographic information science and interest in exploring the spatial perspectives that characterize modern geography are important in admission decisions. Depending on their prior training, graduate students may be required to take courses that are prerequisites for course work in their chosen area of graduate study; credit earned in prerequisites does not count toward the graduate degree.

Application materials include an undergraduate transcript with grade-point average, scores on the Graduate Record Examination (GRE) General Test, three letters of recommendation, and an essay in which the applicant states his or her reasons for wanting to study geography at the University of Iowa.

Applicants whose first language is not English must take the Test of English as a Foreign Language (TOEFL). Their scores must be provided to the University's Office of Admissions.

New graduate students whose first language is not English are required to take a speaking proficiency test when they arrive at the University; eventually they take the English Language Performance Test (ELPT). Students must be fully certified by the ELPT before they begin their fourth semester in order to be considered for funding in succeeding semesters. Students who do not pass the tests are required to take Teaching Assistant Preparation in English (TAPE) courses until they have achieved proficiency in spoken English.

Financial Support

A number of graduate teaching and research assistantships are available. In addition, outstanding applicants and underrepresented minorities are eligible for several fellowships. Awards are based on merit. In making awards, the department pays particular attention to grade-point average, especially for the junior and senior years; score on the Graduate Record Examination (GRE) General Test; letters of recommendation; and fit of the student's objectives with department specializations. Applications for graduate appointments must be received by February 1. Applications for fellowships are due by January 15.

Facilities and Resources

The department houses three geographic information computational laboratories. They support a variety of GIS software packages, including the latest software from ESRI (ArcGIS) and Erdas (Imagine) as well as a suite of other commercial and open-source software. All lab computers are regularly updated to ensure that they are capable of running the latest software at peak performance.

The Geographical Information Systems Instructional Lab (GISIL) is the department's center for GIS teaching as well as a place where students conduct geographic and GIS-related projects. It is equipped with 27 networked student workstations, instructional support technology (e.g., CRT projection), and a suite of peripherals, including a LiDAR 3-D scanner, high-end global positioning system (GPS) units, and a large-format printer.

Environmental modeling and GIS research laboratories contain state-of-the-art machines (Windows and Linux platforms), geoprocessing and statistical software, and an array of software development tools. Projects requiring massive storage or high-performance computing have access to additional resources managed by the University's Information Technology Services research support group. The University of Iowa is a charter member of Internet2, with a high-performance network link to the Department of Geographical and Sustainability Sciences. The University also is a member of the University Consortium on Geographic Information Science.

To aid studies of water resources and physical geography, the department has a laboratory for the analysis of vegetation, soil, and water quality. The laboratory has a variety of field equipment, including soil probes, portable meteorological stations, GPS, ground-based 3-D LiDAR, anemometers, spectrometers, light sensors, and data loggers.

Faculty and graduate students participate in multidisciplinary working groups through the University's Program in Applied Mathematical and Computational Sciences, the Center for Global and Regional Environmental Research, the Center for Health Effects of Environmental Contamination, International Programs, the Institute for Rural and Environmental Health, the Iowa Quaternary Studies Group, and the Public Policy Center. Participation in multidisciplinary working groups also is available through interdisciplinary research grants with investigators from other UI academic units, for example, the College of Engineering, the Carver College of Medicine, and the College of Public Health.

Geographic researchers have access to other University of Iowa resources, as well, such as the University's Main Library, whose collections include more than 115,500 maps; 3,600 atlases and reference works; and around 100,000 aerial photographs, primarily of Iowa.

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<tr>
<th>Course Code</th>
<th>Title</th>
<th>Credit Hours</th>
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<tr>
<td>GEOG:5010</td>
<td>Fundamentals of Geography</td>
<td>3 s.h.</td>
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<tr>
<td>GEOG:5050</td>
<td>Research and Writing in Geography</td>
<td>3 s.h.</td>
</tr>
<tr>
<td>GEOG:7000</td>
<td>Geography Colloquium (taken each semester)</td>
<td>1 s.h.</td>
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<td>Two courses in geography numbered above GEOG:5001</td>
<td>6 s.h.</td>
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<tr>
<td>Two research seminars chosen from GEOG:6500 through GEOG:6900; each course for 3 s.h.</td>
<td>6 s.h.</td>
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</table>
Courses

**Lower-Level Undergraduate**

**GEOG:1000 First-Year Seminar** 3 s.h.
Small discussion class taught by a faculty member; topics chosen by instructor; may include outside activities (e.g., films, lectures, performances, readings, visits to research facilities). Requirements: first- or second-semester standing.

**GEOG:1010 Introduction to Human Geography** 3 s.h.
Geographic examination of how people occupy and shape physical space; examination of global population distribution and migration, language and religion, urban and economic spaces; application of geographic principles to contemporary global issues including social and political conflicts, globalization, and economic development. GE: Social Sciences.

**GEOG:1020 The Global Environment** 3 s.h.
Climate change and interactions between atmosphere and geological, hydrological, and biological systems; response of these systems to climate change and how such responses affect atmospheric processes through feedbacks (e.g., flows of energy, cycles of carbon and water); how geographic differences in such interactions create ecological patterns around the world (e.g., rainforests, prairies). GE: Natural Sciences without Lab.

**GEOG:1021 The Global Environment Lab** 1 s.h.
Laboratory complement to GEOG:1020. Corequisites: GEOG:1020, if not taken as a prerequisite. GE: Natural Sciences Lab only.

**GEOG:1030 Our Digital Earth** 3 s.h.
New technologies that have revolutionized how people navigate in unfamiliar places, locate friends and colleagues, manage cities, and confront environmental problems during the past decade; fundamental concepts related to how geographic information is used to better understand and manage the world and our everyday lives.

**GEOG:1046 People and the Environment: Technology, Culture, and Social Justice** 3 s.h.
How resources, commodities, people, and ideas cross borders; examination of globalization through issues of technology, social justice, environment; perspectives from anthropology, gender studies, geography, energy science, and development. GE: International and Global Issues. Same as ANTH:1046, GWSS:1046.

**GEOG:1050 Foundations of GIS** 3 s.h.
Cartography, map analysis, and geographic information systems; map projections and scale; data collection, remote sensing, and GPS; data structures and organization; cartometry; symbolization and visualization.

**GEOG:1060 Geography of Asia: From Japan to Pakistan** 3 s.h.
Varied cultures and environments of Asia; exploration of physical and cultural landscapes of region; processes of development in context of globalization and regionalism; population growth; rise of megacities and urban agglomerations; ethnic, religious and political diversity and tensions; colonial legacies and emerging economies; food and water scarcity; climate change and biodiversity; natural hazards; migration and double burden of disease. GE: International and Global Issues.

**GEOG:1065 Introduction to Spatial Analysis: Patterns and Processes** 3 s.h.
How patterns of disease are described across a community; how clusters of crime in a community are identified; how we make inferences about processes that shape spatial patterns in society and environment; examples drawn from spatial sciences to introduce fundamental aspects of spatial analysis and develop powerful ways to think about spatial problems; emphasis on applications and interpretation, application of techniques using programs such as Matlab and SPSS; programming experience not required.

**GEOG:1070 Contemporary Environmental Issues** 3 s.h.
Political, economic, cultural, technologic, ecological, and geographic issues associated with natural resource and environmental problems, including population, global climate change, food production, tropical deforestation, waste management. GE: International and Global Issues; Social Sciences.

**GEOG:1090 Globalization and Geographic Diversity** 3 s.h.
Examination of contemporary global society; focus on world regions including physical environment, culture, economy, politics of each region, and relationships between regions; analysis of current conflicts within and between regions including social, religious, political, and economic issues. GE: International and Global Issues; Social Sciences.

**GEOG:1115 Energy and Society: History and Science of Oil** 3 s.h.
History, politics, and science of oil and oil industry. GE: Historical Perspectives. Same as EES:1115, ENVS:1115, HIST:1115.

**GEOG:2110 Population Geography: Societies in Flux** 3 s.h.
Ten million people populated the earth 5,000 years ago, and today there are nearly 20 cities with populations over 10 million and global population over 7 billion—why and where this population growth occurred, consequences of this rapid growth; trends in population processes (e.g., migration, social networks, household structure); population processes crucial to understanding changes to global systems related to energy use, human health, and sustainability; GE: Social Sciences.
GEOG:2130 World Cities 3 s.h.
Exploration of important urban centers, past and present; focus on why cities exist, how they are organized; key social, economic, and cultural roles played in human societies; examination of different historical eras, including ancient, medieval, and modern; analysis of urban physical structures and spatial organization, how they reflect societies that created them; case study cities include Ancient Rome, medieval Vienna, baroque Versailles, mercantile Amsterdam and London, major contemporary industrial and financial centers.

GEOG:2310 Introduction to Climatology 3 s.h.
Introduction to fundamental physical science principles that govern climatic processes and patterns; emphasis on scientific thinking and practice through lecture, discussion, exercises; opportunities to explore real-world climatology applications and questions (What is climate change? How fast is the climate actually warming? What are the contributions from us and how much is natural variability? How is climate change going to affect our weather?). Recommendations: GEOG:1020 or similar earth systems science course. Same as EES:2310.

GEOG:2331 Human Dimensions of Climate 3 s.h.
How climate shapes human societies; focus on how climate and climate variability affects food production, water use, energy use, and human disease systems (e.g., influenza, malaria, air pollution, diarrheal disease); climate change impacts (e.g., sea level rise, droughts, wildfires, famine); societal impact, adaptation and vulnerability, mitigation strategies; policy.

GEOG:2374 Biogeography 3 s.h.
Patterns of plant and animal distribution and their interpretation; historical geography including glaciation and plate tectonics; ecological geography, including physical factors (e.g., climate and geology); applications to conservation in diverse regions. Prerequisites: GEOG:1020 or BIOL:1141 or BIOL:1261 or BIOL:1370 or BIOL:1412. Same as BIOL:2374.

GEOG:2404 African Development 3 s.h.
Problems of economic, political, spatial integration in Africa; patterns and processes of economic development and nation building. GE: International and Global Issues; Social Sciences.

GEOG:2410 Environment and Development 3 s.h.
Environmental impacts of industrial and rural development explored through Third World case studies (Latin America, Africa, South and East Asia); environmental degradation from perspectives of political economy and ecology; class, gender, and indigenous peoples' issues; industry-agriculture linkages.

GEOG:2910 The Global Economy 3 s.h.
Examination of contemporary economic geography; types of national economies, uneven development, role of government in shaping economy, multinational corporations; foundation for understanding national economies and economic statistics; contemporary issues including economic globalization, commodification of nature, de-industrialization. GE: International and Global Issues; Social Sciences.

GEOG:2930 Water Resources 3 s.h.
Introduction to science and policy issues affecting water resources management in the United States; how intersection of people, climate, technology, and geography affects quality, availability, and demand for freshwater resources; basic hydrological processes; water needs of people and ecosystems; influence of regulations and management on water quality, availability, and hazards; historical and contemporary developments in management of water, including international conflicts.

GEOG:2950 Environmental Conservation 3 s.h.
Scientific foundations of biological conservation; strategies used to better connect conservation practice with needs of a growing human population. Prerequisites: GEOG:1020 or ENVS:1080 and GEOG:1070.

GEOG:2990 Readings for Undergraduates arr.
Supervised readings in geography.

Upper-Level Undergraduate and Graduate

GEOG:3001 Special Topics arr.
Contemporary fields of inquiry, such as political economy, regional/African development, biophysical systems, GIS, locational analysis, water resources, economic geography, demographic analysis, environment, urbanization, transportation.

GEOG:3010 Geographic Information Systems and Science 3 s.h.
Solid foundation and introduction to GIS and digital map making; what GIS is and how GIS can contribute to research, careers, and everyday life; fundamentals that underlie GIS, including methods for GIS data collection and georeferencing, spatial modeling, spatial data analysis, and visualization; GIS trends including mobile GIS and the Web.

GEOG:3020 Earth Surface Processes 3 s.h.
Basic geomorphic and environmental processes that shape the earth's surface; emphasis on erosion, transport, deposition by land mass movement (creep, landslides, earth flow), fluid agents (wind, water, ice); methods used to study these processes. Prerequisites: EES:1050 or EES:1080 or ENVS:1080 or GEOG:1020. Same as ENVS:3020, EES:3020.

GEOG:3070 Hungry Planet: Global Geographies of Food 3 s.h.
Societal and environmental implications of past, current, and future global food supply examined from a geographical perspective; focus on questions of who eats what, where, and why; transformative history of agriculture, modern agribusiness and alternative food supplies, geopolitical implications of food production, food scarcity and rising food costs, urban versus rural agriculture, the obesity epidemic versus malnutrition, and the future of food. Same as GHS:3070.
<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>GEOG:3110</td>
<td>Geography of Health</td>
<td>3 s.h.</td>
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<td>Provision of health care in selected countries,</td>
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<td>with particular reference to the Third World;</td>
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<td>focus on problems of geographical, economic,</td>
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<td>cultural accessibility to health services;</td>
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<td>disease ecology, prospective payment systems,</td>
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<td>privatization, medical pluralism. Same as</td>
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<td>GHS:4111.</td>
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<td>GEOG:3210</td>
<td>Health, Work, and the Environment</td>
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<td>Current topics in occupational and environmental</td>
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<td>health; how the United States protects workers,</td>
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<td></td>
<td>protects people from environmental agents, and</td>
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<td>reduces environmental harm. Same as OEH:3210.</td>
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<td>GEOG:3310</td>
<td>Landscape Ecology</td>
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<td>Effects of spatial pattern on spatial processes in</td>
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<td>ecology; characteristics of matrix, patch,</td>
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<td>corridor; deforestation, habitat loss; spatial</td>
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<td>flows of energy, matter, genetic information;</td>
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<td>relationship to human impact, global climate</td>
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<td>change. Requirements: GEOG:2374 or ecology</td>
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<td>course numbered 1000-4999.</td>
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<td>GEOG:3320</td>
<td>Wetlands: Function, Geography, and Management</td>
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<td>Hydrological, geomorphological, and ecological</td>
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<td>processes and their interaction in wetlands;</td>
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<td>geographic differences in wetlands based on</td>
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<td>climate and hydrology; wetlands, lakes, and</td>
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<td>rivers; role of wetlands in drainage basin</td>
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<td>hydrology and flooding; values and valuation of</td>
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<td>wetlands; wetland law and wetland delineation;</td>
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<td>wetlands and water resources. Prerequisites:</td>
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<td>GEOG:2374 or EES:2310. Same as EES:3260.</td>
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<td>GEOG:3340</td>
<td>Ecosystem Services: Human Dependence on Natural</td>
<td>3 s.h.</td>
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<td>Systems</td>
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<td>Ecosystem services—valuable goods and services</td>
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<td>produced by ecosystems (e.g., flood control,</td>
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<td>food production, water purification)—from an</td>
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<td>interdisciplinary perspective centering on</td>
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<td>geographic techniques used to measure, map, and</td>
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<td>model ecosystem services; methods used to</td>
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<td>incorporate ecosystem services into decision and</td>
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<td>policy making; how human activities alter these</td>
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<td>services. Prerequisites: GEOG:1050 and (GEOG:1020</td>
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<td>or GEOG:1070 or GEOG:2374 or GEOG:3310 or</td>
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<td>BIOL:1370 or BIOL:2673 or EES:1080 or ENVS:1080</td>
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<td>or ENVS:2673).</td>
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<td>GEOG:3350</td>
<td>Urban Ecology</td>
<td>3 s.h.</td>
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<td>Main theories and concepts of urban ecology;</td>
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<td>examination of urban ecosystems from an</td>
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<td>interdisciplinary perspective; how cities</td>
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<td>function as socioecological systems in their</td>
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<td>own right and how urban areas function as parts</td>
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<td>of larger regional and global ecosystems; how</td>
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<td>urban form and dynamics influence ecological</td>
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<td>functioning; urban species and nature</td>
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<td>conservation; urban ecological planning and</td>
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<td>design. Requirements: GEOG:2374 or ENVS:2673 or</td>
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<td>introductory course in ecology, and junior</td>
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<td>standing.</td>
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<td>GEOG:3360</td>
<td>Soil Genesis and Geomorphology</td>
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<td>Introduction to soil genesis, soil geomorphology,</td>
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<td>and classification including the basics of soil</td>
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<td>profile description and soil-landscape, soil-</td>
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<td>vegetation, and soil-climate relationships;</td>
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<td></td>
<td>emphasis on study of soils as the interface</td>
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<td></td>
<td>between living and non-living Earth systems and</td>
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<td>the role of soils in sustaining ecosystems and</td>
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<td>human societies; short field excursions and a</td>
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<td>weekend field trip. Requireds: college earth</td>
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<td></td>
<td>science and chemistry. Same as EES:3360.</td>
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<tr>
<td>GEOG:3400</td>
<td>Iowa Environmental Policy in Practice</td>
<td>3 s.h.</td>
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<tr>
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<td>How Iowa government addresses environmental</td>
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<td>policy development and implementation; policy</td>
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<td>process and current environmental issues;</td>
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<td></td>
<td>meetings with Iowa state legislators and relevant</td>
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<td></td>
<td>agency personnel in Des Moines, attendance at</td>
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<td>legislative sessions and hearings, and</td>
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<td>observation of how policies move into practice in</td>
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<td>agency offices; small group work to prepare a</td>
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<td>presentation on a policy or planning issue.</td>
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<td></td>
<td>Requirements: GEOG:3780 or ANTH:3102 or ANTH:3112</td>
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<td></td>
<td>or POLI:3111 or mid-level or higher course in</td>
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<td>environmental policy and planning curriculum;</td>
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<td>and junior or higher standing.</td>
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<tr>
<td>GEOG:3500</td>
<td>Introduction to Environmental Remote Sensing</td>
<td>3 s.h.</td>
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<tr>
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<td>Basic concepts and principles of remote sensing;</td>
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<td>sources of data; georegistration; digital</td>
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<td>processing and classification of remotely sensed</td>
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<td>images for extraction of environmental</td>
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<td>information; linkage of remote sensing</td>
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<td></td>
<td>techniques with GIS analysis.</td>
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<td>GEOG:3505</td>
<td>Foundations of GIS</td>
<td>3 s.h.</td>
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<td>Cartography, map analysis, and geographic</td>
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<td>information systems; map projections and scale;</td>
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<td>data collection, remote sensing, GPS; data</td>
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<td>structures and organization; cartometry;</td>
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<td>symbolization and visualization.</td>
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<td>GEOG:3520</td>
<td>GIS for Environmental Studies</td>
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<td>Methods of managing and processing geographic</td>
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<td>information for environmental analysis; basic</td>
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<td>concepts, structures, theories of geographic</td>
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<td>information system (GIS), basic analytical</td>
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<td></td>
<td>techniques, and hands-on experience in GIS</td>
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<td>operations. Prerequisites: GEOG:1050.</td>
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<td>GEOG:3530</td>
<td>Mapping American Cities and Regions</td>
<td>3 s.h.</td>
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<td>Foundation concepts for GIS-based analysis of</td>
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<td>urban, social, and economic data for the</td>
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<td>United States; geo-referenced sources of U.S.</td>
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<td>national and state data; application to</td>
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<td>contemporary social issues. Prerequisites:</td>
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<td>GEOG:1050.</td>
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<td>GEOG:3540</td>
<td>Introduction to Geographic Visualization</td>
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<td>Basic concepts and techniques that underlie</td>
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<td>cartographic representation and the broader</td>
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<td>field of geographic visualization; digital</td>
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<td>cartographic practices; how scientific</td>
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<td>visualization, information visualization, and</td>
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<td>user interface design contribute to geographic</td>
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<td>visualization; map symbolization, scale and</td>
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<td>generalization, animation and dynamic map</td>
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<td>design, multimedia, virtual and mixed</td>
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<td>environments, interfaces for GIS; experience</td>
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<td>applying cartographic and visualization</td>
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<td>techniques. Prerequisites: GEOG:1050.</td>
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</table>
GEOG:3550 Integrating Time into GIS 3 s.h.
Fundamental concepts for integrating temporal elements into geographic information systems (GIS); conceptual and formal models of time, models of change, event-based modeling, modeling of moving entities; topics related to fundamentals of spatiotemporal databases and query languages. Prerequisites: GEOG:1050.

GEOG:3560 Spatial Analyses of Wind Energy 3 s.h.
Introduction to underlying processes, measurement methods, and spatial analyses related to wind energy; siting criteria, techniques for data collection and analysis, GIS-based approaches to renewable energy siting.

GEOG:3570 Light Detection and Ranging (LiDAR): Principles and Applications 3 s.h.
Basic principles and applications of Light Detection and Ranging (LiDAR); LiDAR as an essential technology for mapping and analysis of a vast range of surfaces; application examples include floodplain mapping, forestry management, transportation planning, vegetation analysis, urban planning, and 3-D modeling; theoretical understanding and practical experience using different software. Recommendations: GEOG:3500 or EES:3100.

GEOG:3750 Environmental Quality: Science, Technology, and Policy 3 s.h.
Geographical perspectives in the study and interpretation of chemicals in the environment; environmental standards under existing laws; local, regional, national, international case studies in environment and health; socioeconomic and institutional considerations in designing environmental protection strategies. Prerequisites: STAT:1020.

GEOG:3760 Hazards and Society 3 s.h.
Introduction to social science perspectives on societal responses to natural and technological hazards; risk perception and communication, disaster management, social vulnerability, and risk assessment; case studies of recent major disasters (e.g., Haiti earthquake, Tohoku earthquake/tsunami/nuclear accident, Hurricane Katrina); current directions in hazards research, policy, and practice. Same as GHS:3760.

GEOG:3780 U.S. Energy Policy in Global Context 3 s.h.
Historical and contemporary aspects of U.S. governmental planning and policy on a wide range of energy issues in global context. Prerequisites: (GEOG:1020 or EES:1080) and GEOG:1070. Same as GHS:3780.

GEOG:3910 Geographic Perspectives on Development 3 s.h.
Theoretical and empirical studies of the regional development process, with emphasis on developing countries; alternative regional development theories and changes in development theories in the literature of geography, related disciplines.

GEOG:3920 Planning Livable Cities 3 s.h.
Development of livable cities in the United States; economic, physical, environmental, and political forces that shape their growth; impact of planning, how it shapes the future of cities. Same as URP:3001.

GEOG:3940 Transportation Economics 3 s.h.
Overview of transportation markets—intercity, rural, urban; transportation modes—rail, highway, air, water, pipeline, transit; issues in finance, policy, planning, management, physical distribution, and environmental, economic, and safety regulation. Recommendations: ECON:1100 and ECON:1200. Same as URP:3350, ECON:3750.

GEOG:3992 Undergraduate Research 3 s.h.
Supervised research in geography.

GEOG:4010 Field Methods in Physical Geography 3 s.h.
Project design and sampling methods of climate, vegetation, soil, landforms, water; projects in areas including field meteorology, soil surveying, vegetation sampling, water quality sampling, use of global positioning systems; introduction to research design.

GEOG:4020 Field Methods: Mapping and Mobile Computing 3 s.h.
Development and application of mobile geographic information technologies; key issues associated with global positioning systems (GPS), wireless technologies, field-based data collection and analysis, ubiquitous computing, and location-based services; experience using GPS, advanced mobile computing technologies, mobile GIS software to construct geographic datasets, and data sampling techniques.

GEOG:4030 Senior Project Seminar 3 s.h.
Development of a research project and preparation of a research report. Offered spring semesters.

GEOG:4150 Health and Environment: GIS Applications 3 s.h.
Applications of GIS and spatial analysis for studying health outcomes and exposure to environmental contaminants at different geographical scales. Same as GHS:4150.

GEOG:4500 Applications in Environmental Remote Sensing 4 s.h.
Theory and practice of remote sensing and digital image processing; practical applications to human-environment interactions. Recommendations: GEOG:3500 or EES:3110 or ENVS:3110.

GEOG:4520 GIS for Environmental Studies: Applications 3 s.h.
Applications of geographic information system (GIS) techniques in environmental change analysis (especially land use/cover change), environmental assessment, hazard/risk analysis, environmental decision making. Prerequisites: GEOG:3520.

GEOG:4570 Spatial Analysis and Location Models 3 s.h.
Application of location models within GIS environments to support decision making; small area demographic forecasting, location-allocation models, regionalization problems, shortest path models, other spatial analysis methods used to support spatial decisions. Prerequisites: GEOG:1050.

GEOG:4580 Introduction to Geographic Databases 3 s.h.
Introduction to key aspects of database design for GIS applications; major database models that support spatial data; formal models for key spatial relationships that underlie many different GIS applications; basics of SQL for making queries on datasets; design and construction of ArcGIS geodatabases; ArcGIS tools for geoprocessing. Prerequisites: GEOG:1050.

GEOG:4650 Simulation in Environmental Geography 3 s.h.
How computer simulations are used in environmental studies, with focus on landscape ecology (spatial patterns of organisms and ecosystems); basics of performing simulations; principles and applications of simulation through readings and performing simulations; frontiers of simulation use in the field; hands-on experience writing computer simulations that capture environmental processes (e.g., changing climate, predator-prey relations, nutrient flux), and analyzing the outcomes. Requirements: advanced courses in environmental geography or environmental science and senior standing.

GEOG:4750 Environmental Impact Analysis 4 s.h.
Environmental impact assessment methodologies; emphasis on cost-benefit-risk, cost-effectiveness and incremental analysis; and overlay and graphic techniques; optimal resource use, system simulation; field trips to local environmental control facilities. Prerequisites: GEOG:1070. Same as URP:4750.

GEOG:4770 Environmental Justice 3 s.h.
Review of theoretical positions for examining environmental justice, application of those theories to environmental controversies around the globe.

GEOG:4870 Applied Geostatistics 3 s.h.
Applications of geostatistical methods to geology, geography, hydrology, environmental sciences, and engineering; variogram, Kriging, analysis of spatial-varied data with varied computer software in participants' specialties. Same as EES:4870.

GEOG:4930 Urban Geography 3 s.h.
Central ideas of modern urban geography, their links to social theory; focus on interrelation between social change, urban environment; evolution of urban systems, emergence of the capitalist city, urban social and residential differentiation, local politics of uneven development.

GEOG:4960 The Middle East 3 s.h.
Middle East cultures, political economy, conflict; significance of the Middle East in world affairs, vice versa.

GEOG:4990 Senior Thesis 3 s.h.
Original research. Requirements: senior standing.

GEOG:4995 Honors Thesis arr.
Original research. Requirements: honors standing.

Graduate

GEOG:5001 Readings arr.
Supervised readings by graduate students in topics of their choice.

GEOG:5010 Fundamentals of Geography 3 s.h.
Geography as an academic discipline; history, advances, epistemology, common themes.

GEOG:5050 Research and Writing in Geography 3 s.h.
Identification of research areas; research questions and hypotheses; responsible conduct of research; methodological decisions; research proposal and paper writing.

GEOG:5070 Special Topics arr.
Contemporary fields of inquiry, such as political economy, regional/African development, biophysical systems, GIS, locational analysis, water resources, economic geography, demographic analysis, environment, urbanization, transportation.

GEOG:5129 Information Systems for Resource Management 3 s.h.
Understanding and managing natural and engineered resources requiring data-reach foundation; management of data; complex data-driven technologies integrated into data and information systems (DIS); hands-on opportunity to develop or use capabilities of DIS for study or research area of interest (science, engineering, industrial operation); wind power generation, an emerging field in Iowa, used as a case study for illustrating key DIS components, links, and functionalities. Same as IE:5129, ME:5129, CEE:5129, ECE:5129.

GEOG:5550 Modeling Space and Time 3 s.h.
How to generate time-space-resolved estimates of sociophysical environmental contexts with the aid of modern geo-spatial technologies; how to model social, behavioral, and health outcomes with reference to multilevel time-space-resolved sociophysical environmental contexts; environmental contexts from air pollution and pesticide concentration to neighborhood diversity; statistical modeling of varied social, behavioral, and health outcomes such as dropping out of college, smoking, excessive weight, asthma, mental and physical disability. Requirements: a course in statistics and good understanding of correlation and regression.

GEOG:5650 Simulations in Landscape Ecology 3 s.h.
Dynamics of land use and land cover change explored through advanced use of computer simulations in landscape ecology; how simulation is used in the field; simulations based on landscape ecology questions, with analysis of results using typical landscape ecology metrics. Prerequisites: GEOG:4650.

GEOG:6100 Seminar in Health and Environment 3 s.h.
Research on health and environment.

GEOG:6264 Planning Sustainable Transportation 2-4 s.h.
Theories and methods of exerting public control over passenger and freight transportation; social and environmental regulation; effects of changing finance, regulation, and pricing policies, including privatization, tolls, impact fees. Same as URP:6265.
GEOG:6300 Seminar in Environment, Conservation, and Land Use 3 s.h.
Research on land use, water resources, conservation.

GEOG:6500 Seminar in Spatial Analysis and Modeling 1-3 s.h.
Research themes in spatial analysis, GIScience, simulation, remote sensing.

GEOG:6632 Crossing Borders Proseminar  arr.

GEOG:6635 Crossing Borders Seminar 2-3 s.h.

GEOG:6900 Seminar in International Development 3 s.h.
Research on GIScience and development.

GEOG:7000 Geography Colloquium  arr.

GEOG:7150 Research in Health and Environment 1-3 s.h.
Directed research in health and environment.

GEOG:7350 Seminar: Environment, Conservation, and Land Use 1-3 s.h.
Directed research in land use, water resources, conservation.

GEOG:7550 Research in Spatial Analysis and Modeling 1-3 s.h.
Directed research in spatial analysis, GIScience, simulation.

GEOG:7750 Research in Environmental Policy 1-3 s.h.
Directed research in environmental justice and policy.

GEOG:7950 Research in International Development 1-3 s.h.
Directed research in international development.

GEOG:7999 Thesis  arr.