GEOGRAPHY AND GEOGRAPHIC INFORMATION SCIENCE

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The Department of Geography and Geographic Information Science offers four areas of undergraduate specialization.

General Geography (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/general-geography-concentration)
Geography majors study how space on the earth's surface is arranged and occupied. Majors in the General Geography track can sample courses from different subfields of geography without having to choose one specialty of the discipline. Upon completion, the students are prepared for a number of diverse employment opportunities, or for further studies in our graduate program in geography.

Geographic Information Science (GIS) (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/geographic-information-science-concentration)
The GIS program emphasizes the creation, use and analysis of digital geographic information to examine economic, environmental, physical and social phenomena. The GIS program provides students with in-depth training in contemporary software packages to prepare them for careers in the field. There is growing demand for professional knowledge of the earth's systems and the use of geographic information systems to enhance business, protect the environment and manage the massive amounts of spatial data now widely available on the internet. The U.S. Department of Labor has identified geospatial technologies as one of the fastest-growing domestic job sectors.

Human Geography (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/human-geography-concentration)
The Human Geography option gives students an opportunity to pursue specialization in the social science aspect of modern geography. The curriculum includes the systematic study of human social organization and its environmental consequences through patterns and processes. Employment opportunities for the Human Geographer include: urban and regional planning, transportation, marketing, real estate, tourism, and international business.

Physical Geography (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/physical-geography-concentration)
The Physical Geography option is for those wishing to specialize in the earth science emphasis of modern geography. Patterns of climates, land forms, vegetation, soils, and water are all included in this option. As a graduate, Physical Geography majors will be equipped for careers in weather forecasting, land and water resources management, rangelands, and river management.

The department also offers a minor in Geography and GIS. The minor will expose students to a comprehensive selection of courses embracing our three broad areas of study: human geography, physical/environmental geography, and geographic information science.

For the Degree of Bachelor of Arts in Liberal Arts and Sciences

Major in Sciences and Letters Curriculum
E-mail: geograph@illinois.edu

Students must complete the core requirements listed below and select one concentration in consultation with an academic advisor.

• General Geography Concentration (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/general-geography-concentration)
• Geographic Information Science Concentration (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/geographic-information-science-concentration)
• Human Geography Concentration (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/human-geography-concentration)
• Physical Geography Concentration (http://catalog.illinois.edu/undergraduate/las/academic-units/geography/physical-geography-concentration)

Geography and Geographic Information Core Requirements

Select one of the following: 1

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>ATMS/</td>
<td>Introduction to Meteorology</td>
<td>3-4</td>
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<tr>
<td>GEOG 100</td>
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<tr>
<td>GEOG 103</td>
<td>Earth's Physical Systems</td>
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<tr>
<td>GEOG 222</td>
<td>Big Rivers of the World</td>
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Choose one of the following: 3-4

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<thead>
<tr>
<th>Course</th>
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<tbody>
<tr>
<td>GEOG 101</td>
<td>Global Development &amp; Environment</td>
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<tr>
<td>GEOG 104</td>
<td>Social and Cultural Geography</td>
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<td>GEOG 105</td>
<td>The Digital Earth</td>
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<td>GEOG 106</td>
<td>Geographies of Globalization</td>
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<tr>
<td>GEOG 110</td>
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<tr>
<td>GEOG 210</td>
<td>Social &amp; Environmental Issues</td>
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Select a Concentration (hours required depend on concentration chosen): 25-37

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
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<tbody>
<tr>
<td>GEOG 371</td>
<td>Spatial Analysis</td>
<td>4</td>
</tr>
<tr>
<td>GEOG 379</td>
<td>Intro to GIS Systems</td>
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</tbody>
</table>

Total Hours 35-49

1 Students in the Physical Geography Concentration may fulfill the core by completing ATMS 100 and GEOG 103 and one of the five courses: GEOG 101, GEOG 104, GEOG 105, GEOG 106 and GEOG 110, with GEOG 371 or GEOG 379 not required.

Minor in Geography and GIS

The minor in Geography and GIS will expose students to a comprehensive selection of courses embracing our three broad areas of study: human geography, physical/environmental geography, and geographic information science. Students select 6 hours at the 100 level, then 3 hours each from the human, physical/environmental, and geospatial sub-disciplines (as listed

Information listed in this catalog is current as of 04/2016
below), and then 3 additional hours from any of the three sub-disciplines for a total of 18 credits. At least 6 hours total must be at the 300 or 400 level.

Two courses selected from the following: 6

<table>
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<td>ATMS/</td>
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<td>GEOG 105</td>
<td>The Digital Earth</td>
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<tr>
<td>GEOG 106</td>
<td>Geographies of Globalization</td>
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<td>GEOG 110</td>
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One course in human geography, selected from the following: 3

<table>
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<tr>
<th>Course Code</th>
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<tbody>
<tr>
<td>GEOG 204</td>
<td>Cities of the World</td>
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<tr>
<td>GEOG 205</td>
<td>Business Location Decisions</td>
</tr>
<tr>
<td>GEOG 224</td>
<td>Geog Patterns of Illinois</td>
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<tr>
<td>GEOG 310</td>
<td>Political Geography</td>
</tr>
<tr>
<td>GEOG 350</td>
<td>Sustainability and the City</td>
</tr>
<tr>
<td>GEOG 356</td>
<td>Geography of South Asia</td>
</tr>
<tr>
<td>GEOG 373</td>
<td>Spring Field Course</td>
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<td>GEOG 384</td>
<td>Population Geography</td>
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<td>GEOG 410</td>
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<td>GEOG 438</td>
<td>Geography of Health Care</td>
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<tr>
<td>GEOG 455</td>
<td>Geog of Sub-Saharan Africa</td>
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<td>GEOG 465</td>
<td>Transp and Sustainability</td>
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<tr>
<td>GEOG 471</td>
<td>Recent Trends in Geog Thought</td>
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<tr>
<td>GEOG 483</td>
<td>Urban Geography</td>
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</table>

One course in physical/environmental geography, selected from the following: 3

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<tbody>
<tr>
<td>GEOG 210</td>
<td>Social &amp; Environmental Issues</td>
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<tr>
<td>GEOG 215</td>
<td>Resource Conflicts</td>
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<tr>
<td>GEOG 222</td>
<td>Big Rivers of the World</td>
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<tr>
<td>ESE 320</td>
<td>Water Planet, Water Crisis</td>
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<tr>
<td>GEOG 373</td>
<td>Spring Field Course</td>
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<tr>
<td>GEOG 381</td>
<td>Environmental Perspectives</td>
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<tr>
<td>NRES/GEOG 401</td>
<td>Watershed Hydrology</td>
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<tr>
<td>GEOG 406</td>
<td>Fluvial Geomorphology</td>
</tr>
<tr>
<td>GEOG 408</td>
<td>Humans and River Systems</td>
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<td>GEOG 412</td>
<td>Geospatial Tech &amp; Society</td>
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<tr>
<td>GEOG 468</td>
<td>Biological Modeling</td>
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<tr>
<td>GEOG 481</td>
<td>Intl Environ Cooperation</td>
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<tr>
<td>GEOG 493</td>
<td>Democracy and Environment</td>
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<tr>
<td>GEOG 496</td>
<td>Climate &amp; Social Vulnerability</td>
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One course in geographic information science, selected from the following: 3

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<tr>
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<tr>
<td>GEOG 380</td>
<td>GIS II: Spatial Prob Solving</td>
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<tr>
<td>GEOG 412</td>
<td>Geospatial Tech &amp; Society</td>
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<tr>
<td>PATH 439</td>
<td>Health Applications of GIS</td>
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<tr>
<td>GEOG 460</td>
<td>Aerial Photo Analysis</td>
</tr>
<tr>
<td>GEOG 473</td>
<td>Digital Cartography &amp; Map Design</td>
</tr>
<tr>
<td>GEOG 476</td>
<td>Applied GIS to Environ Studies</td>
</tr>
<tr>
<td>GEOG 477</td>
<td>Introduction to Remote Sensing</td>
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<td>GEOG 478</td>
<td>Techniques of Remote Sensing</td>
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<td>GEOG 479</td>
<td>Advanced Topics in GIS</td>
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<tr>
<td>GEOG 480</td>
<td>Principles of GIS</td>
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<tr>
<td>One 200-400 level course selected from any of the above.</td>
<td>3</td>
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Total Hours 18

At least 6 hours total must be at the 300 or 400 level.

GEOG Class Schedule (https://courses.illinois.edu/schedule/DEFAULT/DEFAULT/GEOG)

Courses

**GEOG 100 Introduction to Meteorology credit: 3 Hours.**
Same as ATMS 100. See ATMS 100.
This course satisfies the General Education Criteria for:
UIUC: Physical Sciences
UIUC: Quant Reasoning II

**GEOG 101 Global Development&Environment credit: 3 Hours.**
Introduces geographical perspectives on environment and development studies with case studies drawn from Africa, Asia, and Latin America. Investigates the origins of the global South in relation to the global North, especially the historical and contemporary processes driving environmental, economic, and cultural change. This course satisfies the General Education Criteria for:
UIUC: Non-Western Cultures
UIUC: Social Sciences

**GEOG 103 Earth's Physical Systems credit: 4 Hours.**
A basic introduction to the environmental systems of the Earth's surface, including landforms, soils, and ecosystems and how these systems are affected by global change. Emphasizes the importance of human-Earth relations and a holistic view of environmental systems. Same as ESE 103. This course satisfies the General Education Criteria for:
UIUC: Physical Sciences

**GEOG 104 Social and Cultural Geography credit: 4 Hours.**
Introduces the basic concepts of social and cultural geography, and the application of these concepts to a variety of topics; mental maps, territoriality, cultural regions, cultural elements and their diffusion, population movement and migration, settlement patterns, environmental hazards, and spatial patterns of social problems. This course satisfies the General Education Criteria for:
UIUC: Social Sciences

**GEOG 105 The Digital Earth credit: 3 Hours.**
Geospatial technologies such as global positioning systems (GPS) and geographic information systems (GIS) are becoming increasingly important tools in research and policy arenas and in everyday life. This course will provide an introduction to these emerging technologies and to the principles of mapping science that underpin them. At the same time, the course will explore how these innovative technologies are changing the spaces and places around us, including how we interact with the environment and each other. Lab exercises provide hands-on experience in collecting and mapping geospatial information, interpreting digital imagery and the Earth's environments, and critically thinking about the social implications of the digital Earth. This course satisfies the General Education Criteria for:
UIUC: Social Sciences
GEOG 106 Geographies of Globalization  credit: 3 Hours.
A survey of major world regions by systematically considering five themes: environment, population and settlement patterns, cultural cohesion and diversity, geopolitical fragmentation and unity, and economic and social development. While examining the persistence of unique regions, the course will both scale up to global linkages and scale down to place-specific impacts of globalization processes. Same as ESE 106. This course can be used to fulfill either Western or Nonwestern general education categories, but not both.
This course satisfies the General Education Criteria for:
UIUC: Non-Western Cultures
UIUC: Social Sciences
UIUC: Western Compartv Cult

GEOG 198 Freshman Honors Seminar  credit: 3 Hours.
Through discussions and research projects, the seminar is designed to provide an in-depth understanding of topics in the field of systematic or regional geography which are selected for group study. Appropriate geographic methodology is emphasized. Prerequisite: James Scholar standing or other designation as a superior student.

GEOG 199 Undergraduate Open Seminar  credit: 1 to 5 Hours.
May be repeated.

GEOG 204 Cities of the World  credit: 3 Hours.
In-depth exploration of global urbanization. Using a comparative regional approach, discuss the recent history of global urbanization, dissect its problems, and offer possible solutions. Approximately ten major regions of the world will be examined, exploring the significant urban patterns and processes, built and natural environments, and social, economic, and cultural landscapes of each.
This course satisfies the General Education Criteria for:
UIUC: Social Sciences

GEOG 205 Business Location Decisions  credit: 3 Hours.
Analyzes location decision-making emphasizing industrial and commercial location patterns; identifies important institutional factors and their changing roles over the recent past; and focuses on plant closings, economic disruptions, and problems of structural change. Same as BADM 205. Prerequisite: ECON 102 or ECON 103, or equivalent.

GEOG 210 Social & Environmental Issues  credit: 3 Hours.
Introduction to the complex relationship between people and the natural environment from a social science perspective. Explores different approaches to environmental issues, and examines the role of population change, political economy, technologies, environmental policymaking, and social institutions in causing and resolving contemporary social and environmental global issues. Same as ESE 210.
This course satisfies the General Education Criteria for:
UIUC: Social Sciences

GEOG 215 Resource Conflicts  credit: 3 Hours.
Geographic concepts of place, scale, region, and territoriality are used to explore the causes and consequences of competition for the control of natural resources. Situations that lead to violent conflict are discussed as well as mechanisms for the peaceful resolution of resource conflicts. Resources discussed include oil, water, access to land, and the impact of climate change. Same as ESE 215 and GLBL 215.
This course satisfies the General Education Criteria for:
UIUC: Social Sciences

GEOG 221 Geographies of Global Conflict  credit: 3 Hours.
Focuses on contemporary cultural conflicts, competition among nations for economic and mineral resources; treats territorial disputes from a cultural and geographic perspective. Case studies vary to illustrate types of contemporary conflicts. Same as GLBL 221.
This course satisfies the General Education Criteria for:
UIUC: Social Sciences

GEOG 222 Big Rivers of the World  credit: 3 Hours.
An interdisciplinary approach to the study of big rivers, encompassing geomorphology, engineering, ecology, risk assessment and planning. Commencing with an assessment of the nature of big rivers; their hydrology and geomorphic setting; hazards associated with large rivers, and issues of river impoundment and management, then proceed to examine the geography, geomorphology, and ecology and management of a range of the World’s greatest rivers, focusing on how a geomorphological understanding of such large rivers can aid study of riverine ecohabitats and inform decisions regarding water usage and engineering management. If the weather permits, a one day field-trip will be organized in the second half of the course to view aspects of a local river in Illinois/Indiana. Same as ESE 222.

GEOG 224 Geog Patterns of Illinois  credit: 3 Hours.
Systematic analysis of the environmental and human processes that have shaped the regional landscapes of rural and urban Illinois. This course satisfies the General Education Criteria for:
UIUC: Social Sciences

GEOG 280 Intro to Social Statistics  credit: 4 Hours.
Same as SOC 280. See SOC 280.
This course satisfies the General Education Criteria for:
UIUC: Quant Reasoning I

GEOG 287 Environment and Society  credit: 3 Hours.
Same as ESE 287, NRES 287, PS 273 and SOC 287. See NRES 287.
This course satisfies the General Education Criteria for:
UIUC: Social Sciences

GEOG 301 Political Geography  credit: 3 Hours.
Problems and issues surrounding the geographic distribution of political actions and outcomes in the context of globalization. Topics include war and peace, access to natural resources, nationalism, democratization, terrorism, and the politics of identity. Prerequisite: Junior standing or consent of instructor.

GEOG 350 Sustainability and the City  credit: 3 Hours.
Examination of the tools, techniques, strategies, and rationales that can be used by urbanists to produce and sustain a productive, fair, and equitable city. Emphasis is placed on diagnosing, implementing, and sustaining an ideal U.S. city as a complex whole that embeds an array of interconnecting parts (neighborhoods, retail districts, downtowns, city economies). Lectures and discussion cover the broad background of theories, concepts, and principles that will be essential for imagining and implementing these ideals, strategies and plans.) Same as ESE 350.

GEOG 356 Geography of South Asia  credit: 3 Hours.
Geographic survey of the region of South Asia (India, Nepal, Pakistan, Afghanistan, Bangladesh, Sri Lanka). Geographic analysis of development processes since the colonial period, with particular emphasis on the interrelated processes of environment, society, and politics.

GEOG 370 Water Planet, Water Crisis  credit: 3 Hours.
Same as ESE 320 and GEOL 370. See ESE 320.
GEOG 371  Spatial Analysis  credit: 4 Hours.
Overview of the spatial analysis (nomothetic) approach to geographic research, both physical and human; includes discussion of the scientific method, with explanations and uses of analytic geographic concepts in studying real world problems. Prerequisite: A course in geography.

GEOG 373  Spring Field Course  credit: 4 Hours.
Field observation and mapping of human and physical phenomena using basic geographic field techniques; required ten-day field trip during spring term break. Prerequisite: Geography majors, or non-majors with consent of instructor.

GEOG 379  Intro to GIS Systems  credit: 4 Hours.
Investigates the fundamentals of geographic information science as well as the basic skills in the execution of that theoretical knowledge with industry standard software packages. Student will learn the basics of projections and coordinate systems, how geographic information is stored and manipulated, and the theory and practice behind the production of thematic maps. Includes lecture and hands-on laboratory components. Same as ESE 379.

GEOG 380  GIS II: Spatial Prob Solving  credit: 4 Hours.
Study of the analytical capabilities of geographic information systems with an emphasis on learning to solve spatial problems in both the vector and raster data formats. Students will develop the skills necessary to answer questions or solve problems in their areas of interest, with particular emphasis on problems and questions that require multiple steps to resolve. Students will learn the fundamental theory behind spatial problem solving, but also learn to execute these procedures with industry-standard software packages. Thus, this class contains both lecture/discussion elements and hands-on laboratory work. Same as ESE 380. Prerequisite: GEOG 379

This course satisfies the General Education Criteria for: UIUC: Quant Reasoning II

GEOG 381  Environmental Perspectives  credit: 3 Hours.
Focus on the major ideas in contemporary environmentalism, especially on how humans do and should interact with the environment. Same as ESE 381. Prerequisite: Junior or senior undergraduate standing.

GEOG 384  Population Geography  credit: 3 Hours.
Problems and issues surrounding the geographic distribution of populations at the world, regional, and local levels; emphasizes problems associated with population growth and decline, recent population redistribution, births and deaths, and elderly and minority populations.

GEOG 390  Individual Study  credit: 2 to 4 Hours.
Supervised independent study of special topics or regions. May be repeated once. Prerequisite: Junior standing; at least one formal course in the topic or region of interest; consent of instructor.

GEOG 391  Honors Individual Study  credit: 2 to 4 Hours.
Individual study and research projects for students who are working toward the degree with distinction in geography. May be repeated to a maximum of 8 hours. Prerequisite: Junior standing; consent of honors adviser.

GEOG 392  Geography & GIS Internship  credit: 0 to 3 Hours.
Supervised, off-campus experience in a field directly pertaining to Geography and/or GIS. A written report is required at the end of the internship relating work accomplishments to the student's program of study. Approved for Letter and S/U grading. May be repeated in separate terms up to 6 hours. Prerequisite: Consent of faculty sponsor and Director of Undergraduate Studies; at least two courses taken within Geography & GIS.

GEOG 394  Special Topics Social Geog  credit: 4 Hours.
Introduction to current research in social geography; includes such topics as access to public facilities, geography of crime, innovation diffusion, geography of communications, spatial assimilation of minorities, and geography of social well-being. See Schedule for current topics. May be repeated.

GEOG 401  Watershed Hydrology  credit: 3 Hours.
Same as NRES 401. See NRES 401.

GEOG 406  Fluvial Geomorphology  credit: 4 Hours.
Systematic overview of the forms and processes associated with rivers and drainage basins; topics include basin hydrology, drainage networks, river hydraulics, sediment transport processes, channel morphology, channel change, and human impacts on fluvial systems. Same as GEOL 406, and NRES 406. 4 undergraduate hours. 4 graduate hours. Prerequisite: PHYS 101, and GEOG 103 or GEOL 107, or consent of instructor.

GEOG 408  Humans and River Systems  credit: 4 Hours.
Systematic analysis of the biophysical processes operating in rivers and watersheds and the interaction of humans on these processes. The course will emphasize the importance of biophysical processes and human interaction with these processes in river and watershed management. Class discussion and a class project will focus on analysis of practical river and watershed problems. 4 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 103 or an introductory course in earth or environmental science.

GEOG 410  Geography of Dev and Underdev  credit: 4 Hours.
Patterns and processes of Third World development geography. Lectures and discussion draw upon theoretical and case study material by development geographers working in Asia, Africa, and Latin America. 4 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 101, GEOG 110, and ECON 101 are highly recommended.

GEOG 412  Geospatial Tech & Society  credit: 3 Hours.
Examines the use of geographic information systems (GIS), geographical positioning systems (GPS), and other geospatial technologies in everyday life with emphasis on their implications for social, economic, and environmental change. Topics include critical cartography, GIS, and social theory, crime and health, environmental justice, feminism, economic development and environmental change. 3 undergraduate hours. 3 graduate hours. Prerequisite: GEOG 105 or consent of instructor.

GEOG 421  Earth Systems Modeling  credit: 4 Hours.
Same as ATMS 421, ESE 421, GEOL 481 and NRES 422. See ATMS 421.

GEOG 436  Biogeography  credit: 3 Hours.
Same as ANTH 436, ESE 439, IB 439 and NRES 441. See IB 439.

GEOG 438  Geography of Health Care  credit: 3 or 4 Hours.
Methods and perspectives of health care. Emphasizing the spatial analysis of health and health care. The organization, provision and competition of health care will be highlighted. Same as SOC 478. 3 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 384 or SOC 274 or consent of instructor.

GEOG 439  Health Applications of GIS  credit: 3 Hours.
Same as CHLH 439 and PATH 439. See PATH 439.
GEOG 440  Business Applications of GIS  credit: 3 Hours.
Design and implementation of GIS for business and strategic planning applications. Course goals include: (1) provide students with an understanding of Geographic Information Systems; (2) provide students with an understanding of how GIS can be applied in various business applications; (3) familiarize students with GIS and modeling techniques; (4) provide students with opportunities to work with various data sources through a project related to their own interest in business. Same as BADM 440. 3 undergraduate hours. 4 graduate hours.

GEOG 446  Sustainable Planning Seminar  credit: 4 Hours.
Same as NRES 446 and UP 446. See UP 446.

GEOG 455  Geog of Sub-Saharan Africa  credit: 3 Hours.
Regional geography of Africa south of the Sahara. Geographic analysis of Africa which includes topics in both physical and human geography and provides a general overview of the processes and interactions between human and environmental factors that shape Africa's physical and human geography. 3 undergraduate hours. 3 graduate hours.

GEOG 460  Aerial Photo Analysis  credit: 3 or 4 Hours.
Review of methods for extracting quantitative and qualitative information from aerial photographs using computer-based techniques and visual interpretation. The first part of the course will cover basic photogrammetry and mapping. The second part will focus on interpretation of physical, biological, and cultural features. Same as NRES 460. 3 undergraduate hours. 4 graduate hours. Prerequisite: Knowledge of trigonometry (MATH 014 or equivalent) and basic physical geography (GEOG 103 or equivalent).

GEOG 465  Transp and Sustainability  credit: 3 or 4 Hours.
Descriptors of transportation systems; transportation as an industrial activity and public good; and transportation and spatial development, including the role of transportation in urban and regional development. Emphasis on the economic, environmental, and social aspects of sustainability as they apply to transportation systems and the activities they enable at local, regional, national and global levels. Field trip required. Same as ESE 465. Additional fees may apply. See Class Schedule. 3 undergraduate hours. 4 graduate hours. This course satisfies the General Education Criteria for: UIUC: Advanced Composition

GEOG 466  Environmental Policy  credit: 3 or 4 Hours.
Examination of the geographical and political aspects of human-environmental relations; focusing on how environmental problems are defined, negotiated, and addressed through policy formulation. Specific approaches to environmental policy will be considered at different geographical scales. Same as ESE 466. 3 undergraduate hours. 4 graduate hours. Prerequisite: One course in Geography or Political Science or consent of instructor.

GEOG 468  Biological Modeling  credit: 3 or 4 Hours.
Interdisciplinary modeling course for students interested in dynamic system modeling of living processes; each student will build a model by the end of the course. No special mathematical background required. Same as ANSC 449, CPSC 448, and IB 491. 3 undergraduate hours. 4 graduate hours. Prerequisite: IB 444 or equivalent, depending on curriculum.

GEOG 471  Recent Trends in Geog Thought  credit: 4 Hours.
Examination of recent trends in human and physical geography. Themes include empiricism, logical positivism, regionalism, Marxism, realism, phenomenology, and post-modernism as applied to geographic research. Emerging geographic literature is explored to identify the latest conceptual developments. 4 undergraduate hours. 4 graduate hours.

GEOG 473  Digital Cartography & Map Design  credit: 4 Hours.
Instruction and practice in the basic techniques of map making followed by a consideration of problems involved in the construction of maps for presentation in a reproduced form (i.e., printed, photographed); the selection of proper source materials for the base and body of the map, the compilation and correlation of these materials, and methods of mechanical and photographic reproduction. 4 undergraduate hours. 4 graduate hours.

GEOG 476  Applied GIS to Environ Studies  credit: 3 Hours.
Demonstrates how geographic information systems (GIS) have become a major technology ubiquitously applied to solve important problems encountered in geospatial and environmental applications. 3 undergraduate hours. 3 graduate hours. Prerequisite: GEOG 103 or GEOG 104, consent of instructor.

GEOG 477  Introduction to Remote Sensing  credit: 3 Hours.
Fundamentals of energy-matter interaction mechanisms, and the manifestation of reflected and emitted radiation on photographs and images; introduces characteristics of aerial films and filters, electro-optical scanners, and digital processing; and emphasizes applications in environmental problems. Same as NRES 477. 3 undergraduate hours. 3 graduate hours. Prerequisite: GEOG 280 (beginning statistics) or equivalent, or consent of instructor.

GEOG 478  Techniques of Remote Sensing  credit: 4 Hours.
Optical and digital information processing of imagery acquired from aircraft and satellite remote sensing platforms; includes systems design, mensuration theory, photographic enhancement techniques, and automatic digital classification for all of the standard sensor systems; and laboratory focusing on the design and implementation of information processing techniques with application limited to a survey of uses. 4 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 477 or equivalent.

GEOG 479  Advanced Topics in GIS  credit: 3 Hours.
Introduces advanced concepts in Geographic Information Science. Course topics may vary. 3 undergraduate hours. 3 graduate hours. May be repeated, if topics vary, in separate terms to a maximum of 9 hours, but not more than 6 hours in any one term. Prerequisite: GEOG 379 or equivalent.

GEOG 480  Principles of GIS  credit: 3 Hours.
Focuses on Geographic Information Science (GIScience) principles that underlie the development of Geographic Information Systems (GIS) software and its intelligent use. Helps students adapt to rapidly changing geospatial technologies. Knowledge gained in this course will be general and, thus, not be limited to any specific software product that may be revised in the future. 3 undergraduate hours. 3 graduate hours. Prerequisite: GEOG 379 and GEOG 380 or equivalent, or consent of instructor.

GEOG 481  Intl Environ Cooperation  credit: 3 Hours.
Examines the problems, politics and policies related to environmental issues that require international cooperation to address effectively. Transboundary, regional, and global environmental issues will be analyzed, spanning the atmosphere (acid rain, protection of the ozone layer, and climate change), the oceans (pelagic fisheries), and biodiversity (whaling, trade in endangered species). Discusses methods for increasing international environmental cooperation, such as unilateral actions, trade sanctions, financial aid, non-governmental monitoring and innovations in institutional design. Same as ESE 481. 3 undergraduate hours. 3 graduate hours. Prerequisite: One course in Geography or Political Science or consent of instructor.

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GEOG 482  Challenges of Sustainability  credit: 3 Hours.
Same as ESE 482 and GEOL 483. See ESE 482.

GEOG 483  Urban Geography  credit: 3 Hours.
Broad background of theories, concepts, and methods of research for understanding how and why our cities have reached their current status. Focus on examining the internal structure of the North American city, including analysis of the commercial, industrial, and residential sectors of the urban environment. Particular emphasis is placed on the range of urban theories developed to explain both urban structure and contemporary urban ills. 3 undergraduate hours. 3 graduate hours.

GEOG 484  Cities, Crime, and Space  credit: 3 or 4 Hours.
Focusing on US cities, this theory-intensive course surveys traditional and critical perspectives on relations between crime, space, and place. We will explore this interplay within broader contexts of industrial and post-industrial urbanization, concentrating on dynamics including governances, economic processes, and social transformations. Emphasis will be placed on the extent to which these interwoven processes generate, classify, organize, and react to crime across cityscapes. 3 undergraduate hours. 4 graduate hours.

GEOG 489  Programming for GIS  credit: 4 Hours.
Introduction to programming to customize and extend the capabilities of geographic information systems. Topics include the principles of programming, advanced function and tools coding, visualization, fundamental spatial data structures, and spatial algorithms. 4 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 379 and GEOG 380 or equivalents, or consent of instructor.

GEOG 491  Research in Geography  credit: 2 Hours.
Detailed examination and discussion of the methods of initiating and executing research projects in human or physical geography (taught in separate sections); requires students to write a research proposal of a quality suitable for a graduate thesis. 2 undergraduate hours. 2 graduate hours. Prerequisite: GEOG 471; either graduate standing in geography or senior standing as a geography major and consent of department.

GEOG 493  Democracy and Environment  credit: 3 or 4 Hours.
Explores the effects of local democracy on natural resource management and the ways natural resource management can leverage the establishment and consolidation of local democracy. Investigates theoretical foundations of localism and decentralization, and analyzes the policy process by which theory is inscribed in law and project documents and translated into practice. Cases of global environmental policy, such as climate adaptation, UN Reduced Emissions from Deforestation and Degradation of the World Banks' Community Driven Development policies will be used for theoretical and empirical analysis. Draws case examples from developing countries. Same as NRES 494, SOC 493 and UP 493. 3 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 210, course work in social science, or consent of instructor.

GEOG 496  Climate & Social Vulnerability  credit: 3 or 4 Hours.
Existing climate variability and likely climate change call for policies to protect vulnerable people who make their livelihoods in a changing environment. Students will explore: 1) causes of climate related stress and disaster; 2) theories of vulnerability and adaptation; 3) practices and policies designed to reduce economic loss, hunger, famine and dislocation in the face of climate trends and events. Focus on multiple policy scales affecting poor and marginal populations, who are disproportionately vulnerable when facing climate stress, drawing on case examples primarily from the developing world. Same as ATMS 446 and SOC 451. 3 undergraduate hours. 4 graduate hours. Prerequisite: GEOG 410, GEOG 466, GEOG 471, GEOG 520, or consent of instructor.

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