Geography and Earth Science Department (GEO/ESC)

College of Science and Health
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www.uwlax.edu/geography-and-earth-science

Geography is the science of place and space. Geographers ask where things are located on the surface of the earth, why they are located where they are, how places differ from one another, and how people interact with the environment. There are two main branches of geography: human geography and physical geography. Human geography is concerned with the spatial aspects of human existence - how people and their activity are distributed in space, how they use and perceive space, and how they create and sustain the places that make up the earth’s surface. Human geographers work in the fields of urban and regional planning, transportation, marketing, real estate, tourism, and international business. Physical geographers study patterns of climates, land forms, vegetation, soils, and water. They forecast the weather, manage land and water resources, and analyze and plan for forests, rangelands, and wetlands. Many human and physical geographers have skills in cartography and Geographic Information Systems (GIS). Geographers also study the linkages between human activity and natural systems.

Students who are considering studying geography and earth science will probably answer yes to one or more of the following questions: Are you curious about places? Do you like to study maps? Are you interested in the constantly changing pattern of human activity and natural phenomena on the landscape? Are you interested in foreign areas? Do you like to work outside? Are you a problem solver? Are you good at seeing connections among seemingly unrelated processes? Can you adapt to rapid technological change? Do you try to see the bigger picture? Are you interested in connections between humans and the environment?

2015-16 Faculty/Staff

The following is the department’s faculty and staff as of the publication date of this catalog. This list will not be updated again until the next catalog is published in June.

Professor
Rafique Ahmed
Cynthia Berlin
Georges Cravins

Assistant Professor
Colin Belby
Joan Bunbury
Gargi Chaudhuri
Paul Reyerson
Daniel Sambu

Lecturer
Jeffrey Kuery

GIS Lab Manager
Steven Fulton

Administrative Support
Karen Ott

Majors
- Geography major - BA (http://catalog.uwlax.edu/undergraduate/geography/geography-ba)
- Geography major - BS (http://catalog.uwlax.edu/undergraduate/geography/geography-bs)
- Geography major: environmental science concentration - BA (http://catalog.uwlax.edu/undergraduate/geography/environmental-science-ba)
- Geography major: environmental science concentration - BS (http://catalog.uwlax.edu/undergraduate/geography/environmental-science-bs)
- Geography major: geographic information science concentration - BA (http://catalog.uwlax.edu/undergraduate/geography/geographic-information-science-ba)
- Geography major: geographic information science concentration - BS (http://catalog.uwlax.edu/undergraduate/geography/geographic-information-science-bs)
- Geography education major (early adolescence-adolescence certification) - BS (http://catalog.uwlax.edu/undergraduate/geography/geography-education)
- Social studies education (broad field) major (early adolescence-adolescence certification) - BS (http://catalog.uwlax.edu/undergraduate/geography/social-studies-education)

Minors
- Geography minor (http://catalog.uwlax.edu/undergraduate/geography/geographyminor)
- Geographic information science minor (http://catalog.uwlax.edu/undergraduate/geography/geographicinformationscienceminor)
- Geoarchaeology minor (http://catalog.uwlax.edu/undergraduate/geography/geoarchaeologyminor)
- Geography education minor (http://catalog.uwlax.edu/undergraduate/geography/geographyeducationminor)
- Earth science minor (http://catalog.uwlax.edu/undergraduate/geography/earthscienceminor)
- Earth science education minor (http://catalog.uwlax.edu/undergraduate/geography/earthscienceducationminor)

Honors
- Geography and earth science honors program (http://catalog.uwlax.edu/undergraduate/geography/honors-program)
  + next to a course number indicates a general education course
Earth Science Courses

ESC 101 Cr. 4

Earth Environments
This course concentrates on understanding the earth's dynamic environments through the study of processes and physical and human interactions related to the lithosphere, hydrosphere and atmosphere. A scientific approach is used to examine fundamental concepts in earth and environmental science related to topics such as plate tectonics, landscape development, atmospheric processes, global climate, and water resources, in order to provide an understanding of how the earth system functions and the human role in these phenomena. Lect. 3, Lab 2. Offered Fall, Spring.

ESC 211 Cr. 3

Global Warming and Climate Change
This course explores the scientific basis of global warming and climate change, and their current and likely impacts on human society and the environment, before addressing the action that could be taken by governments, by industry, and by individuals to mitigate the effect. Discussion of global warming is situated in the context of models of climate change, focusing on alternative interpretations of the effects of anthropogenic greenhouse gases on global warming. Offered Fall, Spring.

ESC 221 Cr. 4

Introduction to Climate Systems
An introduction to physical principles and the dynamic processes that govern the behavior of the atmosphere at global and regional scales. Spatial and temporal variations of energy, moisture, circulation, and weather systems; and the patterns of the world climate systems are discussed. Lect. 3; Lab 2. Prerequisite: ESC 101. Offered Fall.

ESC 222 Cr. 4

Landforms: Processes and Regions
An introduction to the earth surface processes that are dominant in forming various types of landforms. Spatial variations in landform will be studied both at the local scale and as the outcome of large-scale global processes, including the effects of plate tectonics and global climatic change. Lect. 3, Lab 2. Prerequisite: ESC 101. Offered Fall.

ESC 250 Cr. 3

Maps and GIS
Students will acquire fundamental knowledge and learn key concepts underlying spatial data, different map types and uses, thematic symbolization and visualization, and spatial analytical techniques. They will learn how to critically assess and communicate knowledge concerning spatial environments. Students will also learn how to use GIS and Web mapping technologies. Lect. 2, Lab 2. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.

ESC 270 Cr. 1-3

Geographic Themes
Specifically selected topics or skills which may be designed for the interest of special groups will be offered with formalized instruction and methodology appropriate to geography and/or earth science. This course may be counted as an elective in the geography major or earth science minor at the discretion of the Geography/Earth Science Department. Prerequisite may be required at the discretion of the department. Repeatable for credit - maximum six. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC 345 Cr. 3

Remote Sensing
Introduction to remote sensing, emphasizing satellite multispectral observations of the earth applied to such fields as agriculture, forestry, water resources, urban and regional planning, and environmental assessment. Upper Midwest and selected areas worldwide are explored with visual and digital image processing techniques. (Cross listed with ESC/GEO; may only earn credit in one department.) Offered Fall.

ARC/ESC/GEO 347 Cr. 3

Geoarchaeology
An applied course on the contribution of earth sciences to the interpretation of archaeological contexts. This course will consist of field, lab and lecture components. Emphasis is placed on the methods of geoarchaeology and the applications of selected earth science fields to archaeological problems. Field trips will be a required component of the course in order to complete field descriptions and sampling. Prerequisite: ARC 196 or ESC 222 or ESC/GEO 426 or ESC/GEO 430. (Cross-listed with ARC/ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 355 Cr. 3

Map Design and Geovisualization
In this course students will learn about the process of making maps, how to acquire and appropriately manipulate spatial data, and how to design clear, compelling, and beautiful maps. In addition to the key theories underlying the cartographic discipline, students will learn technical skills to enhance their other research interests and make them far more competitive on the job market once they graduate. To that end, students will apply their newfound knowledge about map design using cutting edge software. Lect. 2, Lab 2. Prerequisite: GEO/ESC 250. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.

ESC/GEO 385 Cr. 3

Introduction to Geographic Information System and Science
An introduction to both theoretical and applied aspects of Geographic Information Systems (GIS). GIS software, with an emphasis on ArcGIS, will be used to explore geographic questions. Hands-on exercises pertaining to environmental science, natural resource management, business, and urban planning will be used to complement lecture material. Topics will include data organization, database structure, input and output, data quality, and geographic analysis of spatial and attribute data. Lect. 2, Lab 2. Prerequisite: ESC/GEO 250; MTH 145. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.

ESC/GEO 390 Cr. 3

Geographic Field Methods
Covers fundamental concepts of field methods as applied to physical, cultural, urban and environmental geography. Students will gain experience in sampling, field surveying, GIS mapping, and observational data collection techniques. Includes reconnaissance and detailed surveys using current methods, GPS and field equipment; and practical integration of field data into a geographic information system. Lect. 2, Lab 2. Prerequisite: ESC/GEO 385 or concurrent enrollment. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall.
ESC/GEO 401 Cr.1
Focus on Geography: A Capstone Course
A seminar-style course designed to prepare students for graduate school and/or a career in geography/earth science. This course will cover the basic concepts of interviewing, graduate school application, oral presentation of a topic, and the writing of professional abstracts. The development of the field will be studied by the reading and discussion of landmark articles in geography and earth science. Students are expected to actively participate in the assessment of their major. Prerequisite: senior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Pass/Fail grading. Offered Fall.

ESC/GEO 422/522 Cr.3
Meteorology and Weather Forecasting
Various principles and laws which govern the behavior of the atmosphere are investigated. Laws of gases and radiation, energy exchange between the earth and the atmosphere, laws of motion, various forces governing atmospheric motion, atmospheric moisture and psychrometry, condensation, precipitable water and precipitation, atmospheric stability/instability, thermodynamic characteristics of the atmosphere, vorticity, and synoptic meteorology are discussed. Surface and upper-air charts, synoptic patterns, thermodynamic charts, radar and satellite images, and weather patterns are analyzed for weather forecasting. Prerequisite: ESC 101 or equivalent; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.

ESC/GEO 425/525 Cr.3
Biogeography
A systematic analysis of the geographic distribution of organisms from historical, ecological and regional perspectives. Emphasis is placed on the principles and the methods of biogeography. Special reference is made to bio-geographic regions, the distribution of organisms in space and time, and ecological biogeography. Prerequisite: ESC 221; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 426/526 Cr.4
Soil Morphology and Genesis
A comprehensive study of soils around the world and the factors and processes that drive their formation and dynamic evolution. Emphasis is placed on soil morphology, pedogenesis, and biogeochemical influences within the soil environment. A one-credit lab section is devoted to the hands-on exploration and study of soils through laboratory and field exercises. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 427 Cr.3
Water Resources
A study of physical water resources systems and management and utilization of water as a resource. Class activities will include seminars on critical water resource management issues and hands-on analysis of pertinent data, including exercises in Geographic Information Systems. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Alternate Years.

ESC/GEO 430/530 Cr.3
Fluvial Geomorphology
A systematic study of the interactions between flowing water and surface landforms. Emphasis is placed on watershed and stream development, sediment transport and storage, flow frequency analysis, and applications of fluvial principles to river management and stream restoration. Class activities will include field exercises in the La Crosse region, mathematical analysis of hydrologic variables, and spatial analysis with Geographic Information Systems. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring - Odd Numbered Years.

ESC/GEO 440/540 Cr.3
Geographic Interpretation of Aerial Photographs
Systematic applications of aerial photographs in the interpretation and analysis of geographic problems. Emphasis is placed on the interpretation of digital photographs within a geographic information system. Topics include urban and rural land use, natural resource, and environmental assessment. Lect.2, Lab 2. Prerequisite: ESC/GEO 385; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 445/545 Cr.3
Advanced Remote Sensing
Advanced techniques of digital satellite and airborne image analysis and processing, emphasizing theory and applications in natural resource, land use and environmental assessment. Includes practical approaches to integrating imagery with geographic information systems for spatial analyses and decision making. Data acquisition, integrity, manipulation, formatting, storage, and retrieval are also examined. Prerequisite: ESC/GEO 345. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.

ESC/GEO 450 Cr.3-12
Geography Internship
Practical experience with a variety of organizations where the student’s geographic background and training can be utilized to advantage. Students are placed in carefully selected positions screened by the department. Actual work supervision is accomplished by personnel of the selected agency and the department staff coordinator. A maximum of five credits may be counted toward the non-education major. Prerequisite: geography major; cumulative GPA of 2.25 with a minimum of 2.75 GPA in geography; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Pass/Fail grading. Offered Fall, Spring, Summer.

ESC/GEO 455/555 Cr.3
Web Mapping
In this course, students will learn how to produce and design interactive Web maps for communication. Web maps take many forms and they are continually changing. Thus, the objective of this course is to do two things: (1) develop proficiency in the scripting languages and tools most frequently used to design and create these maps; and (2) teach the theory and concepts underlying good Web map design so that as the technologies change in the future students will still be able to design effective Web maps. At the end of this course, students will be able to design a Web map from scratch. Lect. 2, Lab 2. Prerequisite: ESC/GEO 250; ESC/GEO 355; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.

ESC/GEO 460/560 Cr.3
Environmental Hazards and Land Use
Environmental processes are investigated in light of the hazards they might pose for development and how they may be avoided or mitigated by proper land use planning. Prerequisite: ESC/GEO 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 470/570 Cr.1-3
Special Topics in Geography/Earth Science
Specifically selected topics or skills which may be designed for the interest of special groups will be offered with formalized instruction and methodology appropriate to geography and/or earth science. May be counted as an elective in the geography major or earth science minor at the discretion of the Geography/Earth Science Department. Prerequisite may be required at the discretion of the department. Repeatable for credit - maximum six. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.
ESC/GEO 476/576 Cr.1-3  
**Geography/Earth Science Topics for Teachers**  
Selected topics in geography and/or earth science pertinent to applications in the teachers' classrooms. Courses are designed to meet the needs of teachers so that they may implement the course material into their classroom teaching. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 495/595 Cr.1-3  
**Seminar in Geography/Earth Science**  
Investigation into various topics in geography or the earth sciences. Varying topics will be offered at intervals with a specific title assigned to each. Prerequisite: two semesters of geography and/or earth science. Additional prerequisite may be required by the instructor. Repeatable for credit - maximum six. Maximum three credits applicable to major. Maximum three credits from any instructor. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Consent of instructor. Offered Fall, Winter, Spring, Summer.

ESC/GEO 499 Cr.1-3  
**Undergraduate Research**  
Individual research by an advanced student under the supervision of a faculty member in the geography/earth science department. The student must present a written report and either have their work published in an appropriate journal or presented either orally or by poster at a conference acceptable to the department chair and adviser. A contract must be signed by the student, the project advisor, the student’s advisor and the Geography/Earth Science Department Chair. Repeatable for credit - maximum three. Three credits may be applied to a major or minor in geography and earth science. Prerequisite: 12 credits of geography and/or earth science with six of the credits numbered 300 or above, or consent of the instructor and department chair. (Cross-listed with GEO/ESC; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 102 Cr.3  
**Maps and Society**  
This course introduces all aspects of maps and how they affect the individual in society. It examines the evolution of maps, the map as an art form, the map as a communication medium for spatial knowledge, the meaning of maps and their relationship to culture and society past and present, the influence of maps on an individual through mass media and the Internet, and the way maps reflect personal and societal points of view. It focuses on privacy and civil liberty issues of the individual in the age of digital information where maps and map databases can disclose the privacy of personal space. In addition, today’s GIS maps (in planning, in marketing, in hazard controls, etc.) embed substantial amounts of personal information that can affect personal security and how our lives are directly, indirectly, knowingly, and unknowingly influenced. Offered Fall, Spring.

+GEO 110 Cr.3  
**World Cultural Regions**  
This course provides an understanding of the global distribution of world cultures. The cultural, economic and natural patterns and their interrelationships are examined on a global and regional scale. The development and distribution of cultural regions within countries are included when appropriate. Offered Fall, Spring.

+GEO 200 Cr.3  
**Conservation of Global Environments**  
Introduction to natural resources, resource management, environmental and land use ethics, environmental impacts of resource utilization and strategies to resolve environmental conflicts. Course examines the relationships between society and the environment from the global to the local scale. Offered Fall, Spring.

GEO 201 Cr.3  
**Geography of United States and Canada**  
Physical and cultural characteristics of United States and Canada. Changing patterns of land use and the accompanying economic and cultural development of the various regions. Offered Spring.

+GEO 202 Cr.3  
**Contemporary Global Issues**  
This course will offer a contemporary multi-disciplinary perspective regarding the major issues and trends confronting the global society as it enters the 21st century. Emphasis will be given to a critical review and assessment of the origin and present condition of the plethora of situations and problems affecting modern global society. The student will also learn to critically evaluate current and future events. The course will incorporate the views and approaches of the following disciplines: sociology/anthropology, economics, geography, political science, and history. (Cross-listed with ANT/ECO/GEO/HIS/POL/SOC 202; may only earn credit in one department.) Offered Fall, Spring.

GEO 204 Cr.3  
**Geography of Wisconsin**  
Geographic patterns in Wisconsin. Physiographic regions, climate, population distribution, resources and their use, agriculture, industry, transportation, and urban growth. Offered Fall - Odd Numbered Years.

GEO 208 Cr.3  
**Applications of Geographic Information Systems I**  
An introduction to applied aspects of Geographic Information Systems. GIS software, with an emphasis on ArcGIS, will be used to develop working proficiency with basic GIS procedures and applications. Topics include data input and output, forming queries, data overlay processes, and creating map layouts. Prerequisite: not open to geography majors. Offered Occasionally.

ESC/GEO 250 Cr.3  
**Maps and GIS**  
Students will acquire fundamental knowledge and learn key concepts underlying spatial data, different map types and uses, thematic symbolization and visualization, and spatial analytical techniques. They will learn how to critically assess and communicate knowledge concerning spatial environments. Students will also learn how to use GIS and Web mapping technologies. Lect. 2, Lab 2. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.
ESC/GEO 270 Cr.1-3

Geographic Themes
Specifically selected topics or skills which may be designed for the interest of special groups will be offered with formalized instruction and methodology appropriate to geography and/or earth science. This course may be counted as an elective in the geography major or earth science minor at the discretion of the Geography/Earth Science Department. Prerequisite may be required at the discretion of the department. Repeatable for credit - maximum six. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

GEO 300 Cr.3

Population Geography
A systematic analysis of the populations of the world and the geographic factors influencing human existence. A study of the origin and distribution of populations and the cultural features with which they are associated. Offered Fall - Odd Numbered Years.

GEO 304 Cr.3

Geography of Europe
Geographic factors in the changing physical, political, cultural and economic patterns in Europe. Emphasis on northwestern, central, and southern Europe and their importance in world affairs. Offered Fall - Odd Numbered Years.

GEO 306 Cr.3

Economic Geography
This course introduces students to the global economic patterns which have shaped and conditioned the world of the 1990s, and the salient economic geography models and approaches which help to explain such patterns. Elements emphasized include the evolution of social and economic organization; the globalization of economic activity since the late 1400s; the interconnectivity of development and underdevelopment; and the relationship between development and social environmental problems. Prerequisite: GEO 110 or ECO 110 or HIS 101 or ANT/ECO/GEO/HIS/POL/SOC 202. Offered Fall.

GEO 307 Cr.3

Political Geography
A real differentiation and analysis of relationships between geographic factors and political entities. This includes physical environment, organization of space, cultural influences, and economic capabilities. Offered Occasionally.

GEO 308 Cr.3

Applications of GIS II
Advanced exploration of geographic information systems tools and applications. GIS software, with an emphasis on ArcGIS, is used to develop advanced GIS skills. Topics include: working with coordinate systems, editing and managing relational databases, working with ArcGIS extensions, and GIS project management. Prerequisite: GEO 208. Not open to geography majors. Offered Spring.

GEO 309 Cr.3

Urban Geography
Geographical study of cities, their form, function, site and situation. Classification of cities, urban land use patterns, and the role of the city within its region. Offered Occasionally.

GEO 312 Cr.3

Geography of Africa
Cultural, physical and economic characteristics including the bases of problems in socio-economic development are investigated from a geographic perspective. Resources, regions, and world ties are studied. Offered Spring.

GEO 318 Cr.3

The Geography of Latin America & the Caribbean
The cultural and physical characteristics of Latin America and the Caribbean region are systematically examined and explained. This includes an examination of diverse physical and 'built' environments that encompass this region, from the borderlands of northern Mexico to the Tierra Del Fuego of the south; from the lush tropical environments of the Amazon, Jamaica, and Puerto Rico, to the Altiplano and arid regions of the west; from disparate lowlands to the startling mountain zones of the Andes. Indigenous civilizations which developed out of unique arrangements with these complex environments as well as those imposed and imported since 1500 will be explored in depth. Offered Fall.

GEO 328 Cr.3

Geography of East and Southeast Asia
The geography of China, Japan, the Koreas, and Mongolia; the geography of the 10 states of Southeast Asia, including Indonesia, Thailand, Vietnam, Philippines, and Burma. Contemporary geopolitical problems and prospects; East Asia and the world; primordial and historical factors contributing to identity and conflict. The course emphasizes human-cultural patterns, salient physical characteristics, and the relationship between these. Offered Spring - Even Numbered Years.

GEO 331 Cr.3

Geography of the Middle East, Central and South Asia
Cultural, physical and economic elements of this predominantly Islamic domain are examined from a geographic perspective for a better understanding of this region of the world. Cultural and socio-economic impact of these regions on other regions and cultures of the world, including their resources, are investigated. Offered Fall - Even Numbered Years.

ESC/GEO 345 Cr.3

Remote Sensing
Introduction to remote sensing, emphasizing satellite multispectral observations of the earth applied to such fields as agriculture, forestry, water resources, urban and regional planning, and environmental assessment. Upper Midwest and selected areas worldwide are explored with visual and digital image processing techniques. (Cross listed with ESC/GEO, may only earn credit in one department.) Offered Fall.

ARC/ESC/GEO 347 Cr.3

Geoarchaeology
An applied course on the contribution of earth sciences to the interpretation of archaeological contexts. This course will consist of field, lab and lecture components. Emphasis is placed on the methods of geoarchaeology and the applications of selected earth science fields to archaeological problems. Field trips will be a required component of the course in order to complete field descriptions and sampling. Prerequisite: ARC 196 or ESC 222 or ESC/GEO 426 or ESC/GEO 430. (Cross-listed with ARC/ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 355 Cr.3

Map Design and Geovisualization
In this course students will learn about the process of making maps, how to acquire and appropriately manipulate spatial data, and how to design clear, compelling, and beautiful maps. In addition to the key theories underlying the cartographic discipline, students will learn technical skills to enhance their other research interests and make them far more competitive on the job market once they graduate. To that end, students will apply their newfound knowledge about map design using cutting edge software. Lect. 2, Lab 2. Prerequisite: GEO/ESC 250. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.
ESC/GEO 385 Cr.3
Introduction to Geographic Information System and Science
An introduction to both theoretical and applied aspects of Geographic Information Systems (GIS). GIS software, with an emphasis on ArcGIS, will be used to explore geographic questions. Hands-on exercises pertaining to environmental science, natural resource management, business, and urban planning will be used to complement lecture material. Topics will include data organization, database structure, input and output, data quality, and geographic analysis of spatial and attribute data. Lect. 2, Lab 2. Prerequisite: ESC/GEO 250; MTH 145. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.

ESC/GEO 390 Cr.3
Geographic Field Methods
Covers fundamental concepts of field methods as applied to physical, cultural, urban, and environmental geography. Students will gain experience in sampling, field surveying, GPS mapping, and observational data collection techniques. Includes reconnaissance and detailed surveys using current methods, GPS and field equipment; and practical integration of field data into a geographic information system. Lect. 2, Lab. 2. Prerequisite: ESC/GEO 385 or concurrent enrollment. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall.

ESC/GEO 401 Cr.1
Focus on Geography: A Capstone Course
A seminar-style course designed to prepare students for graduate school and/or a career in geography/earth science. This course will cover the basic concepts of interviewing, graduate school application, oral presentation of a topic, and the writing of professional abstracts. The development of the field will be studied by the reading and discussion of landmark articles in geography and earth science. Students are expected to actively participate in the assessment of their major. Prerequisite: senior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Pass/Fail grading. Offered Fall.

ESC/GEO 385 Cr.3
Introduction to Geographic Information System and Science
An introduction to both theoretical and applied aspects of Geographic Information Systems (GIS). GIS software, with an emphasis on ArcGIS, will be used to explore geographic questions. Hands-on exercises pertaining to environmental science, natural resource management, business, and urban planning will be used to complement lecture material. Topics will include data organization, database structure, input and output, data quality, and geographic analysis of spatial and attribute data. Lect. 2, Lab 2. Prerequisite: ESC/GEO 250; MTH 145. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.

ESC/GEO 425/525 Cr.3
Biogeography
A systematic analysis of the geographic distribution of organisms from historical, ecological and regional perspectives. Emphasis is placed on the principles and the methods of biogeography. Special reference is made to bio-geographic regions, the distribution of organisms in space and time, and ecological biogeography. Prerequisite: ESC 221; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Alternate Years.

ESC/GEO 426/526 Cr.4
Soil Morphology and Genesis
A comprehensive study of soils around the world and the factors and processes that drive their formation and dynamic evolution. Emphasis is placed on soil morphology, pedogenesis, and biogeochemical influences within the soil environment. A one-credit lab section is devoted to the hands-on exploration and study of soils through laboratory and field exercises. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 427 Cr.3
Water Resources
A study of physical water resources systems and management and utilization of water as a resource. Class activities will include seminars on critical water resource management issues and hands-on analysis of pertinent data, including exercises in Geographic Information Systems. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Alternate Years.

ESC/GEO 430/530 Cr.3
Fluvial Geomorphology
A systematic study of the interactions between flowing water and surface landforms. Emphasis is placed on watershed and stream development, sediment transport and storage, flow frequency analysis, and applications of fluvial principles to river management and stream restoration. Class activities will include field exercises in the La Crosse region, mathematical analysis of hydrologic variables, and spatial analysis with Geographic Information Systems. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring - Odd Numbered Years.

ESC/GEO 440/540 Cr.3
Geographic Interpretation of Aerial Photographs
Systematic applications of aerial photographs in the interpretation and analysis of geographic problems. Emphasis is placed on the interpretation of digital photographs within a geographic information system. Topics include urban and rural land use, natural resource, and environmental assessment. Lect.2, Lab 2. Prerequisite: ESC/GEO 385; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 445/545 Cr.3
Advanced Remote Sensing
Advanced techniques of digital satellite and airborne image analysis and processing, emphasizing theory and applications in natural resource, land use and environmental assessment. Includes practical approaches to integrating imagery with geographic information systems for spatial analyses and decision making. Data acquisition, integrity, manipulation, formatting, storage, and retrieval are also examined. Prerequisite: ESC/GEO 345. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.
ESC/GEO 450 Cr.3-12

Geography Internship
Practical experience with a variety of organizations where the student's geographic background and training can be utilized to advantage. Students are placed in carefully selected positions screened by the department. Actual work supervision is accomplished by personnel of the selected agency and the department staff coordinator. A maximum of five credits may be counted toward the non-education major. Prerequisite: geography major; cumulative GPA of 2.25 with a minimum of 2.75 GPA in geography; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Pass/Fail grading. Offered Fall, Spring, Summer.

ESC/GEO 455/555 Cr.3

Web Mapping
In this course, students will learn how to produce and design interactive Web maps for communication. Web maps take many forms and they are continually changing. Thus, the objective of this course is to do two things: (1) develops proficiency in the scripting languages and tools most frequently used to design and create these maps; and (2) teaches the theory and concepts underlying good Web map design so that as the technologies change in the future students will still be able to design effective Web maps. At the end of this course, students will be able to design a Web map from scratch. Lect. 2, Lab 2. Prerequisite: ESC/GEO 250; ESC/GEO 355; junior standing. (Cross-listed with ESC/GEO, may only earn credit in one department.) Offered Spring.

ESC/GEO 460/560 Cr.3

Environmental Hazards and Land Use
Environmental processes are investigated in light of the hazards they might pose for development and how they may be avoided or mitigated by proper land use planning. Prerequisite: ESC 221 or ESC 222. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 470/570 Cr.1-3

Special Topics in Geography/Earth Science
Specifically selected topics or skills which may be designed for the interest of special groups will be offered with formalized instruction and methodology appropriate to geography and/or earth science. May be counted as an elective in the geography major or earth science minor at the discretion of the Geography/Earth Science Department. Prerequisite may be required at the discretion of the department. Repeatable for credit - maximum six. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 475/576 Cr.1-3

Geography/Earth Science Topics for Teachers
Selected topics in geography and/or earth science pertinent to applications in the teachers' classrooms. Courses are designed to meet the needs of teachers so that they may implement the course material into their classroom teaching. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

GEO 485/585 Cr.3

Advanced Geographic Information Science
Advanced theories in geographic information systems database structures, advanced applications, database transfers, database management, use of census data, spatial analysis, and decision-making. Emphasis on ARCGIS and its applications. Integration of GIS with remote sensing and GPS. Lect. 2, Lab. 2. Prerequisite: MTH 145; ESC/GEO 385; junior standing. Offered Spring.

GEO 488 Cr.3

Spatial Data Analysis
Theory, methods, and techniques for quantitative analysis of spatial data. Students will learn and employ basic quantitative techniques for describing, modeling, and analyzing spatial data. This course explores point pattern analysis, methods for continuous data, and spatial regression. Focus will be on the interpretation and the application of spatial data analysis techniques to address geographic problems. Prerequisite: MTH 145. Offered Occasionally.

ESC/GEO 490/590 Cr.2-3

Independent Study
Individual readings and investigation of selected problems in geography. Open to senior majors and minors with a "B" (3.00) average in geography. Registration with consent of regular advisor, instructor, department chairperson, and the dean of the college in which the student is enrolled. Repeatable for credit - maximum six. Maximum three credits applicable to major. Maximum three credits from any instructor. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Consent of instructor. Offered Fall, Winter, Spring, Summer.

ESC/GEO 495/595 Cr.1-3

Seminar in Geography/Earth Science
Investigation into various topics in geography or the earth sciences. Varying topics will be offered at intervals with a specific title assigned to each. Prerequisite: two semesters of geography and/or earth science. Additional prerequisite may be required by the instructor. Repeatable for credit - maximum six. Variable topics; check semester timetables. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 499 Cr.1-3

Undergraduate Research
Individual research by an advanced student under the supervision of a faculty member in the geography/earth science department. The student must present a written report and either have their work published in an appropriate journal or presented either orally or by poster at a conference acceptable to the department chair and adviser. A contract must be signed by the student, the project advisor, the student's advisor and the Geography/Earth Science Department Chair. Repeatable for credit - maximum three. Three credits may be applied to a major or minor in geography and earth science. Prerequisite: 12 credits of geography and/or earth science with six of the credits numbered 300 or above, or consent of the instructor and department chair. (Cross-listed with GEO/ESC; may only earn credit in one department.) Offered Fall, Winter, Spring, Summer.

Undergraduate research by an advanced student under the supervision of a faculty member in the geography/earth science department. The student must present a written report and either have their work published in an appropriate journal or presented either orally or by poster at a conference acceptable to the department chair and adviser. A contract must be signed by the student, the project advisor, the student's advisor and the Geography/Earth Science Department Chair. Repeatable for credit - maximum three. Three credits may be applied to a major or minor in geography and earth science. Prerequisite: 12 credits of geography and/or earth science with six of the credits numbered 300 or above, or consent of the instructor and department chair. (Cross-listed with GEO/ESC; may only earn credit in one department.) Offered Fall, Winter, Spring, Summer.