Earth Science (ESC) - Courses

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 serves as an introduction to causes of natural and human-induced climate change, and the current and future impacts of climate change on environmental systems and society. Actions that could be taken by governments, industry, non-profit organizations, and individuals to mitigate the magnitude and effects of climate change will be addressed. The course will investigate social, cultural, and political aspects associated with climate change policy, including how vulnerability, resilience, and adaptability to a changing climate vary across the globe. Offered Fall, Spring, Summer.

ESC 222 Cr.4
Weather and Climate
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 305 Cr.3
Earth Surface Processes and Landforms
An introduction to the earth surface processes that are dominant in forming various types of landforms. Spatial variations in landforms will be studied both at the local scale and as the outcome of large-scale global processes. Lect. 3, Lab 2. Prerequisite: ESC 101. Offered Spring.

ESC 405/505 Cr.3
Geographic Information System and Science II
Building upon lessons learned in ESC/GEO 305, this course focuses on geospatial analysis and database development. The course includes both theoretical and applied aspects of GIS analysis. GIS software, with an emphasis onArcGIS, 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 305; STAT 145; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall, Spring.

ESC 410/510 Cr.3
Geospatial Field Methods
This course provides an introduction to the Unmanned Aerial System (UAS) from the geospatial perspective which includes: UAS sensors and platforms, civilian and remote sensing applications, sensors calibration and boresighting, operational requirements, data processing using specialized software to derive products such as ortho-rectified imagery, multispectral imagery, digital terrain and surface models, current rules and regulations governing owning and operating a UAS in the United States. Students in this course will get hands-on experience of UAS mission planning and flying with both fixed-wing and multi-rotor UAS for environmental data collection outside the classroom. The course content will also prepare the students for the remote pilot exam conducted by the FAA. They will complete hands-on lab exercises involving UAS data pre-processing and analysis to generate geospatial products and assess their accuracy. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 405 or concurrent enrollment; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall.

ESC 412/512 Cr.3
Geospatial Applications of Unmanned Aerial Systems
This course provides an introduction to the Unmanned Aerial System (UAS) from the geospatial perspective which includes: UAS sensors and platforms, civilian and remote sensing applications, sensors calibration and boresighting, operational requirements, data processing using specialized software to derive products such as ortho-rectified imagery, multispectral imagery, digital terrain and surface models, current rules and regulations governing owning and operating a UAS in the United States. Students in this course will get hands-on experience of UAS mission planning and flying with both fixed-wing and multi-rotor UAS for environmental data collection outside the classroom. The course content will also prepare the students for the remote pilot exam conducted by the FAA. They will complete hands-on lab exercises involving UAS data pre-processing and analysis to generate geospatial products and assess their accuracy. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 405; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC 415/515 Cr.3
Remote Sensing of the Environment I
This course is an 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/ expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 305; junior standing. (Cross listed with ESC/GEO, may only earn credit in one department.) Offered Fall.
ESC/GEO 418/518 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. Students will apply their knowledge about map design using cutting edge software. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 305; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall.

ESC/GEO 422/522 Cr.3
**Meteorology**
Atmospheric concepts and processes of the earth’s weather are covered. Principles and laws which govern the behavior of the atmosphere are investigated, including energy exchange between the earth and the atmosphere, forces governing atmospheric motion, atmospheric moisture and stability, condensation and precipitation processes, air masses and cyclogenesis, thunderstorm and tornado development, and hurricanes. Surface and upper-air charts, synoptic patterns, thermodynamic charts, radar and satellite images, and weather patterns are analyzed. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC 221; 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC 101; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall - Odd Numbered Years.

ESC/GEO 427/527 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC 101; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring - Odd Numbered Years.

ESC/GEO 428/528 Cr.3
**Past Environmental Change**
An overview of the study of environmental change during the Quaternary. Approaches used to understand past climatic conditions and effects on terrestrial and marine ecosystems at global, regional and local scales will be explored, as will physical, geochemical and biological methods associated with continuous and depositional environments. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC 221 and ESC 222; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Alternate Years.

ESC/GEO 430/530 Cr.3
**River Systems**
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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC 222; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring - Odd Numbered Years.

ESC/GEO 440/540 Cr.3
**Remote Sensing of the Environment II**
This course covers advanced techniques of digital satellite and airborne image analysis and processing, emphasizing theory and applications in natural resource, land use and environmental assessment. It 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 405; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 445/545 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 415; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.

ESC/GEO 450 Cr.1-12
**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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 305; ESC/GEO 418; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.

ESC/GEO 460/560 Cr.3

Environmental Hazards
Environmental processes are investigated in light of the hazards they might pose for development and how they may be avoided, mitigated and managed. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC 221 or ESC 222; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Fall - Even Numbered Years.

ESC/GEO 465/565 Cr.3

Scripting in GIS
This course will teach students how to customize within GIS software using scripting and programming tools commonly used in GIS discipline. Students will learn about the conceptual and practical aspects of programming for geographic applications using Python, a free open-source scripting language. Python is well integrated with all the major GIS softwares and a very popular language among GIS professionals. The course focuses on solving geographic problems by modifying and automating generic GIS software through programming. In this course, students will learn general and transferable scripting skills, and GIS-specific applications, including the basics of writing and modifying scripts, batch processing and automation of repetitive geoprocessing tasks, and designing complex geoprocessing tasks. The skills learned in this course are equally applicable in scientific research, the public sector, and in industry. Students taking this course must be familiar with geographic data structures, basic GIS concepts, and demonstrate basic understanding of geospatial analysis. No prior programming experience is required or expected. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 405; junior standing. (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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. 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 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Occasionally.

ESC/GEO 485/585 Cr.3

Geographic Information System and Science III
This course covers advanced theories in geographic information systems database structures, advanced applications, database transfers, database management, use of census data, spatial analysis, and decision-making. There will be an emphasis on ARCGIS and its applications and integration of GIS with remote sensing and GPS. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: ESC/GEO 405; STAT 145; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Spring.

ESC/GEO 488/588 Cr.3

Spatial Data Analysis
This course covers the 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Prerequisite: ESC/GEO 405 or concurrent enrollment; STAT 145; junior standing. (Cross-listed with ESC/GEO; may only earn credit in one department.) Offered Alternate Years.

ESC/GEO 490/590 Cr.2-3

Independent Study
Individual readings and investigation of selected problems in geography. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. 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. Topics will be offered at intervals with a specific title assigned to each. Check schedule of classes for the next offered topic. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Repeatable for credit - maximum six. Prerequisite: two semesters of geography and/or earth science; junior standing. Additional prerequisite may be required by the instructor. (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.