GEO - Geographic Information Science Graduate Program

Fundamentals of GIS Certificate Program
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www.uwlax.edu/academics/department/geography-and-environmental-science/ (https://www.uwlax.edu/academics/department/geography-and-environmental-science/)

This certificate prepares graduate students with the technological and theoretical skills needed to apply geospatial tools. Over the last few decades, geospatial tools have become increasingly complex, prompting a large demand for individuals with formal training. The field of geographic information science (GIS) is highly interdisciplinary and has wide range of applications within academia and industry. Outside the traditional fields of geography and environmental sciences, GIS is utilized in archeology, biology, crime analysis, data sciences, epidemiology and public health, emergency planning and disaster management, recreation management, water and wastewater management, telecommunication, engineering and business services, aerospace and defense, transportation and logistics, and oil and gas exploration.

By completing this certificate, students will gain experience with common commercial and open-source geospatial software. The certificate's core and elective courses cover five aspects of the University Consortium for Geographic Information Science's GIS and Technology Body of Knowledge: (i) Conceptual Foundations, (ii) Geospatial Data Collection, Processing, and Management, (iii) Cartography and Visualization, (iv) Data Modeling, and (v) Analytical Methods.

Students need to complete nine credits, including three credits of a core course and six credits of elective courses, and submit a GIS portfolio to the program advisor upon completion of the program.

Eligibility

The Fundamentals of GIS Graduate Certificate is open only to **degree-seeking graduate students** at UWL with limited prior GIS experience. Students must be enrolled in another graduate degree-seeking program at UWL to earn this certificate.

Program length

The Fundamentals of GIS Graduate Certificate is typically the same length as the student's degree-seeking program as the certificate cannot be awarded until the student completes their degree-seeking program. UWL graduate degree-seeking programs are typically two to three years in length. Program lengths are based on how long the required UWL coursework would take to complete for a full-time student who does not need to complete any prerequisite coursework. Program length may be extended if students attends part-time (if approved by program) or due to the requirements of an individual student's degree-seeking plan of coursework, research or capstone project.

Certificate

- Fundamentals of geographic information science (GIS) - certificate program (http://catalog.uwlax.edu/graduate/programrequirements/geography/graduate-fundamentals-gis-certificate/)

Courses

GEO 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 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. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: GEO 305; STAT 145. Offered Fall, Spring.

GEO 410/510 Cr.3
Geospatial Field Methods
This course covers fundamental concepts of geospatial data collection, analysis, and representation. Students gain hands-on experience using geospatial technology at field sites in the La Crosse area. It includes reconnaissance and surveys using current methods, including GPS, total stations, sonar, and unmanned aerial systems; and practical integration of field data into a geographic information system. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Lect. 2, Lab 2. Prerequisite: GEO 305 or GEO 590. Offered Fall.

GEO 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: GEO 305. Offered Occasionally.

GEO 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: GEO 305. Offered Fall.

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: GEO 305. Offered Fall.

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: GEO 221. Offered Spring.

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 biogeographic 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: GEO 101. Offered Fall - Odd Numbered Years.

GEO 427/527 Cr.3
Sustainable Water Resource Management
Sustainable Water Resource Management is designed to engage students in critical thinking with regard to the management of water resources within the socio-ecological framework. Students will understand how the interacting dynamics of the natural environment, social factors, politics, and economics shape sustainable water resources policies and practices. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. Offered Fall - Odd Numbered Years.

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: GEO 221 and GEO 222. Offered Alternate Years.

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: GEO 222. Offered Spring - Odd Numbered Years.

GEO 445/545 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 area 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: GEO 415/515. Offered Spring.

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: GEO 305; GEO 418/518. Offered Spring.

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: GEO 221 or GEO 222. Offered Fall - Even Numbered Years.

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. Student 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: GEO 405/505. Offered Occasionally.

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. Prerequisite may be required at the discretion of the department. Repeatable for credit - maximum six. Offered Occasionally.

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: GEO 405/505; STAT 145. Offered Spring.

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: GEO 405/505 or concurrent enrollment; STAT 145. Offered Alternate Years.

GEO 490/590 Cr.1-3
Independent Study
This course is a directed study of a topic in geography and earth science that is outside what is offered through regularly scheduled courses and is completed under the direction and supervision of a member of the Geography and Earth Science faculty. This course is taught largely at an undergraduate level. Graduate students will have additional course requirements/expectations. A written report is an expected outcome. Repeatable for credit - maximum six. Maximum three credits applicable to major. Consent of department. Offered Fall, Winter, Spring, Summer.

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. Additional prerequisites may be required by the instructor. Offered Occasionally.

GEO 790 Cr.1-3
Directed Study
Individual readings and investigations of selected topics in geography and earth science. Repeatable for credit - maximum three. Prerequisite: permission of the instructor and the department chair. Offered Fall, Spring.