GEOINT-Counted Courses

Core (9 credits in total)

GEOG 263 Introduction to Geographic Information Systems (3)

Geographic Information Systems (GISs) represent a major advancement in computer handling of geographical data. These systems are used extensively throughout all levels of government, private industry, and academia to provide support for spatial decision making and problem solving. Principles and methods of Geographic Information Systems are presented with an emphasis on modeling the Earth and abstracting geographical data, collection of geographical data using modern techniques such as GPS, mapping information, and analyzing patterns and spatial relationships. Practical experience with GIS is provided during the lab exercises using a state-of-the-art GIS. Students are provided free copies of the GIS software. No prerequisites required.

GEOG 341 Cartography (3)

This course is an introduction to the principles and practice of map design. It provides the student with an understanding of the most appropriate ways of symbolizing geographic data on maps. Students develop cartographic skills through the completion of map projects using the latest Geographic Information Systems (GIS) software. Students learn how to design effective and attractive maps through lectures, demonstrations, discussions, and creating their own maps. In the latter half of the course, each student completes a final mapping project, based on a topic he or she selects.

GEOG 345 Interpretation of Remote Sensing (3)

This course introduces the basics of remote sensing in a broad scope of satellite imagery, aerial/drone photography and photogrammetry for earth observations. Emphasis is placed on training the student to become a competent user of remotely sensed data for a variety of geographic and multidisciplinary applications.

Specialization track (6 credits in total)

GEOG 531 Quantitative Methods in Geographic Research (3)

This course will deal with the nature of geographical data sets, and statistical measures and models commonly used by geographers to describe spatial variations and patterns, distributions, and relationships among geographical data. Each student will be given opportunities to apply these techniques to geographical datasets, with practice involving use of computer-based exercises and written examinations. The course assumes knowledge of basic algebra. The course does not focus on the derivation of equations, but rather focuses on applications.

GEOG 541 Advanced Cartography (3)

This course examines current issues and approaches in cartography and geographic visualization, focusing on the uses of interactivity and animation in cartography to facilitate

thinking, problem solving, and decision making. The student will gain experience in the use of computers and graphics software to develop interactive cartographic visualizations.

GEOG 551 Remote Sensing of the Environment (3)

This course deals with geospatial analysis and environmental applications of remotely sensed imagery acquired from various sensors (multi-spectral, thermal, Lidar, etc.) and platforms (satellite, aerial, drones, etc.). The computer-assisted image processing techniques include image correction, spatial/spectral transformation, image classification/change detection, and their applications to solve real-world environmental problems.

GEOG 552 LiDARgrammetric and Photogrammetric Digital Surface Mapping (3)

The purpose of the course is to present concepts and approaches for mapping the Earth's terrain and vegetative surface from photogrammetric and lidargrammetric technologies. Both technologies are state-of-the-art in practical applications. The goal of each approach is to correctly determine the geographic position (in x-y-z) of surface features. Both technologies use fundamental algebraic approaches for determining position. Photogrammetry is fundamentally based on stereography while lidargrammetry is based on position from trilateration of visible/infrared light. Each week, the concepts and methods using LiDAR will be presented and discussed. Laboratory assignments will then require students to apply these approaches to imagery and data for mapping the location of elevation, vegetative, and buildings. Graduate students will conduct an independent final project using either lidargrammetric method.

GEOG 554 Spatial Programming (3)

How to find the centroid, perimeter, or area of a polygon? How can the system tell that two geographical features overlap each other? How to develop your own algorithms to extract information from spatial data? How to automate a series of tasks to solve a complex spatial problem? This course addresses these fundamental spatial questions from a programming perspective. With this course, students will be able to 1) develop fundamental programming skills with Python by working with spatial data in the context of GIS, 2) gain practical experience in designing and developing tools to solve specific spatial problems by programming with ArcGIS and other spatial packages, and 3) understand the principles of popular GIS data models and algorithms, and the internal operations of GIS software. Prior experience with programming languages such as Python, Java, C++, Perl and VBA is helpful but not required. Hands-on programming exercises will be accompanied with most of the lectures to help students gain programming experience as well as enhance the understanding of discussed concepts/techniques.

GEOG 563 Advanced Geographic Information Systems (3)

This course covers the technical and conceptual bases of Geographic Information Systems. This includes how GIS is used to perform spatial analysis, analysis of networks, incorporation of remote sensing data, and three-dimensional surfaces. An integral part of this course is the extensive experience students gain using an operational geographic information system. This experience allows the exploration of theoretical topics presented

as well as examination and formulation of real-world applications areas as diverse as real estate, crime analysis, environmental protection.

GEOG 564 GIS Based Modeling (3)

The purpose of the course is to present geographical and temporal modeling concepts using GIS modeling languages and techniques. Practical laboratory experience with state of-the-art software and hardware will be used. Material covered will include the cartographic modeling language concepts by Tomlin, deterministic and statistical models, coupled/embedded approaches for modeling implementations, and calibration/validation techniques. By the end of the course, students should be able to make informed decisions about the appropriate conceptual model, scale of analysis, and GIS implementation strategy for geographical modeling problems. Students will also be able to implement a variety of embedded models using ArcGIS and python/Model Builder. Application examples in the course includes physical processes (e.g. hydrology, toxic-releases, flora mapping, animal behavior) and human-environment interaction (e.g. hazards, facility siting, accessibility, attitudes-behavior). Students entering this course should have the equivalent of an introduction to GIS course and some experience with a scripting language (e.g. HTML, JavaScript, Python).

GEOG 565 GIS Databases and Their Use (3)

This course is to present the concepts and approaches for representing, maintaining, and analyzing geographic data in a geographic information system (GIS) database. Students will create and use GIS databases in desktop and web-site implementations. Real-world examples of government and commercial applications will be often used. First, a review of the fundamental GIS data models is presented. The creation, storage, and maintenance of geographic data in the context of a relational database management context are covered. The use of a database extender for creating/accessing GIS data in the relational database is introduced. The remainder of the course is devoted to the practice of exploiting common framework geospatial data. Each week, the concepts and implementation methods will be discussed, followed by laboratory assignments that will require students to apply these approaches to GIS applications.

Elective (3 credits, 300+, to be approved).

Spatial data analysis must be involved in the course. Selected from the following areas:

- Computational and analytical methods (*Statistics, Computer Science, programming, Math, etc.*)
- Political and cultural studies (*Political Science, International Studies, Human and Regional Geography, etc.*)
- Visualization and data representation (*Geo-visualization*)
- Natural Sciences and resource managements (*Geology, Marine Science, Environmental Science, Environmental Studies, etc.*)

Capstone (3 credits)

GEOG 495 Seminar in Geography (3)

This is a capstone course for undergraduate Geography majors and is a requirement for Geography majors for graduation. It is taught only during Fall semesters. A significant portion of the course is devoted to group-based research activities designed to integrate geographic knowledge and to apply geographic skills to real-world problems. Students will learn about crafting research questions, designing a methodology, and carrying out a research plan. Students' geographical knowledge and skills will be demonstrated through presentations and papers. In addition, students will learn professional development skills, including resume preparation and interview techniques. Tips for obtaining post-graduate jobs in the private, public, and non-profit sectors and for applying to graduate school will be discussed.

***or* 495 equivalent**

A semester-long approved independent study project involving significant geo-intelligence related work

(*revised 17 October 2024*)