Introduction to Geospatial Sciences

Geospatial Science is the quantitative and analytical study of relationships of events and processes in space and time. In recent years, powerful new technologies and techniques have emerged that greatly improve our ability to acquire, archive, analyze and communicate information regarding people, places and other processes on or near the Earth's surface. These same technologies and analytical frameworks allow us to combine this information into multi-tiered databases describing complex and inter-related aspects of our physical and social world. Such databases can then be analyzed in novel ways that take the spatial nature of disparate phenomena and processes into account. The insights produced by these analyses are revolutionizing many fields of science, decision making, government operations and business, and through now-commonplace consumer products such as web-based mapping systems and Global Positing Systems (GPS) units, are directly impacting the everyday lives of ordinary individuals.

The mission of the minor in Geospatial Sciences is to offer students a broad understanding of the fundamental theories and concepts underlying spatial analysis, hands-on experience with contemporary Geospatial Science hardware and software, and experience in the application of geospatial analysis to contemporary problems in environmental management, urban planning, business management, disease and health management, crime analysis and other fields.

Requirements for the Minor in Geospatial Sciences: A minor in Geospatial Sciences consists of 20 credit hours. To be **admitted** in the minor a student must have a minimum grade-point average of 2.5. To **earn** a minor in Geospatial Sciences a student must earn a C or above for all required courses for this minor. The required courses are: GEA 2000 (4), GEO 2200 (3), GEO 2200L (1) GIS 3006C (4) GIS 4043C (4) and GIS 4035C (4).

Students transferring credit hours toward a minor in Geospatial Science must complete 12 credit hours within the Department, regardless of the number of credit hours transferred. Up to eight (8) hours can be transferred toward the minor only if students have earned C or higher in the transfer courses.

Currently, two courses for this minor can be completed online: GEA 2000 and GIS 3006.

Course Descriptions:

GEA 2000 World Regional Geography

This course is designed to introduce the student to the geography of the world. In addition to refreshing our memories about *where* things are, we explore the processes that underlie the complicated mosaic of human society across the globe. Understanding patterns of development, regional and global conflict, environmental degradation and cultural variation is urgent if we are to create solutions to pressing problems of war, poverty and environmental destruction. By examining the world by regions, we will become familiar with the diversity that reflects unique physical and cultural places, as well as the unity that links all human beings on this planet together. Student Learning Outcomes:

1. (ALAMEA) Students will demonstrate knowledge of one of the world regions through analysis of examples of those regions/countries' historical or contemporary social, political, economic, environmental, and/or cultural life.
2. (ALAMEA) Students will demonstrate understanding of contemporary interconnections between regions related to one or more global issues, themes and/or conflicts.
3. (SOCIAL SCIENCE) Students will demonstrate knowledge about the role played by factors such as race, age, gender, ethnicity, economic status, environment, etc., in influencing human social interaction.
4. (HISTORICAL PERSPECTIVES) Students will demonstrate knowledge of the history of human civilizations, societies and cultures, and an awareness of the human experience and its applicability to the

contemporary world through study of political, social, cultural, environmental, and intellectual issues in pre-modern and modern eras.

GEO 2200 and 2200L Introduction to Physical Geography with Lab

In this introductory level course, we will examine the natural environment by describing important aspects of the atmosphere and solid earth—but our most important goal is to provide students with a broad survey of the chief physical processes that help provide explanations for why environmental features are located where they are. Understanding processes of energy and moisture flow through the atmosphere helps us account for patterns of weather and climate, while apprehending plate tectonics and the movement of air, water, and ice across the landscape help explain the appearance of a myriad of different land forms. The course helps students meet the NATURAL SCIENCE portion of the university's Liberal Arts General Education requirement. Physical Geography Lab provides students an opportunity to work with data that helps illustrate many of the scientific concepts used in Physical Geography.

GIS 3006C: Computer Cartography

This course is an introduction to the concepts and techniques of thematic mapping and the capture, storage, and visualization of digital geographic data. Students are expected to develop skills necessary for designing and evaluating cartographic representations of information. The course has five specific goals:

1. to provide an understanding of techniques by which geographic features are referenced on the earth and the methods by which they can be represented digitally for mapping and analysis purposes;
2. to provide a background to the fundamental principles of cartography, map design, and production;
3. to expose students to a variety of thematic mapping techniques;
4. to familiarize students with a widely-used mapping/GIS software application (*ArcGIS*); and
5. to ensure that students are prepared adequately for advanced courses on geographic information systems (GIS), cartographic modeling, and spatial analysis.

GIS 4043C: Introduction to GIS

This is a senior level course on principles, theories and applications of Geographic Information Systems (GIS) with an emphasis on analytical capabilities in both raster and vector domains. This course should provide the students with the basic principles of GIS, and challenge them to apply the principles and theories to solve spatial problems. Students will not only learn the basic concepts of GIS, they will have hands on experience with a GIS software to solve spatial problems. This course will serve as a foundation for advanced courses in GIS and environmental/spatial modeling. Each student who successfully completes this course will have developed the skill to apply GIS tools to spatial problems.

GIS 4035C: Remote Sensing of the Environment

Remote sensing is the process of collecting data about objects or landscapes features without coming in direct physical contact with them. Most remote sensing is performed from orbital or sub-orbital platforms using instruments, which measure electromagnetic radiation reflected or emitted from the terrain. Remote sensing is a technique that can be used in a wide variety of disciplines, but is not a discipline or subject itself. The primary goal of remote sensing is the pursuit of knowledge and the application of the knowledge gained. This course has three main objectives: 1) to provide upper-division undergraduates with a comprehensive overview of remote sensing systems and applications, 2) to familiarize students with methods and techniques involved in interpreting aerial photos and satellite images, and 3) to familiarize students with remote sensing hardware and software and introduce students to the concept of digital image processing.