

# GIS - GEOGRAPHIC INFORMATION SYSTEMS

## GIS 161 GIS I: Fundamentals of Geospatial Science and Technology (3 Credit Hours)

Introduction to the fundamental concepts of Geographic Information Science and Technology (GIS&T) including Geographic Information Systems (GIS), Global Positioning Systems (GPS), cartography, remote sensing, and spatial analysis. Exploration of how geospatial technologies are used in addressing human and environmental issues.

*Equivalent to BIO 160, ENV 160, GIS 160.*

**Academic Level:** Undergraduate

## GIS 162 GIS II: Appl/Geospatial Sc/Tech (3 Credit Hours)

A project-based approach to the uses of Geospatial Technology, including Geographic Information Systems (GIS), Global Positioning Systems (GPS), cartography, remote sensing, and spatial analysis through a series of hands-on computer based exercises. Course content is based upon the United States Department of Labor's Geospatial Technology Competency Model for entry level geospatial occupations including Geospatial or GIS Technicians.

**Academic Level:** Undergraduate

## GIS 210 GIS 2: Applications of GIS (3 Credit Hours)

This GIS course will use a project-based approach to teach you Geographic Information Systems (GIS), Global Navigation Satellite System (GNSS), cartography, remote sensing, and spatial analysis through a series of hands-on computer and field-based exercises. We will explore how geospatial analysis addresses human and environmental issues such as land use and planning, epidemiology, social science, business, geography education and more.

**Academic Level:** Undergraduate

## GIS 224 Remote Sensing (3 Credit Hours)

Remote sensing is a group of techniques for collecting information about an object and its surroundings without physical contact. Remote sensing technologies may be applied to a variety of disciplines and problems including environmental monitoring, oceanography, agriculture, resource management, and archaeology. This course will concentrate on the collection and analysis of spatial data using aerial photography and satellite imagery and explore the relationship between remote sensing and GIS. The classroom and laboratory times are combined and used for presentation of theory, followed by hands-on application of the technologies.

May be repeated for credit. *Equivalent to BIO 224, ENV 224.*

**Academic Level:** Undergraduate

**Corequisites:** GIS 224L

## GIS 224L Remote Sensing Lab (1 Credit Hours)

This laboratory course will concentrate on the collection and analysis of spatial data using aerial photography and satellite imagery and explore the relationship between remote sensing and GIS. The classroom and laboratory times are combined and used for presentation of theory, followed by hands-on application of the technologies.

May be repeated for credit. *Equivalent to BIO 224L, ENV 224L.*

**Academic Level:** Undergraduate

**Corequisites:** GIS 224

## GIS 315 GIS Projects and Programming (4 Credit Hours)

Technology is rapidly evolving and impacting all geospatial fields. This course will examine the latest technology through numerous projects and computer programming. The course will focus on Python as it is the most widely used language for GIS applications. Applications of coding will focus first on basic operations, such as plotting, but then move to work on geospatial analysis and migrating workflows away from GIS user interfaces and into computer scripts. Students will choose projects relevant to their interests, career goals, and community needs. Students will design a final project to show case their mastery of GIS topics.

**Academic Level:** Undergraduate

**Corequisites:** GIS 315L

## GIS 315L GIS Projects and Programming Lab

Students will apply skills through exercises and real-world applications/projects using field data collection, satellite data retrieval, and/or analysis of existing spatial data layers. Activities will include flying unoccupied aerial vehicles (UAVs) for imaging, photogrammetry, and/or lidar data collection. Data processing will occur through application of python scripting among other software packages. Students will work on a project relevant to their interests, career goals, and community needs to showcase the skills they have developed across the GIS curriculum.

**Academic Level:** Undergraduate

**Corequisites:** GIS 315

## GIS 324 Remote Sensing (4 Credit Hours)

Remote sensing is a group of techniques for collecting information about an object and its surroundings without any physical contact. In this course we concentrate on aerial and satellite measurements using optical, radar, and other parts of the electromagnetic spectrum. Students will learn how to acquire and manipulate data and how to extract information from imagery. Application of these techniques to environmental monitoring, oceanography, agriculture, resource management, archeology and other disciplines will form the basis of the course. Students will learn computer software that aids in processing and analyzing large images from satellites and aerial platforms. Students will also learn field techniques in drone imaging and mapping.

**Academic Level:** Undergraduate

**Corequisites:** GIS 324L

## GIS 324L Remote Sensing Lab

Students will be exposed to a wide array of laboratory exercises, both in the field and from downloading data from the internet, regarding remote sensing of Earth. Exercises will include image analysis and data processing to understand the impacts of climate change and human activities around the planet. Field exercises will include data collection from unoccupied aerial vehicles, boats, GNSS, or other remote sensing based methods.

**Academic Level:** Undergraduate

**Corequisites:** GIS 324

## GIS 363 Spatial Analysis (4 Credit Hours)

In this laboratory course students will apply advanced GIS analytical tools to address attribute and spatial queries on single and multiple layers, analyze spatial point patterns, conduct network, surface and raster-based analyses, construct explanatory and predictive models, and convey model results through cartographic output and report generation. GIS 563L is a co-requisite with GIS 563.

**Academic Level:** Undergraduate

**GIS 363L Spatial Analysis Lab**

In this laboratory course students will apply advanced GIS analytical tools to address attribute and spatial queries on single and multiple layers, analyze spatial point patterns, conduct network, surface and raster-based analyses, construct explanatory and predictive models, and convey model results through cartographic output and report generation. GIS 363L is a co-requisite with GIS 363.

**Academic Level:** Undergraduate

**Corequisites:** GIS 363

**GIS 364 Spatial Analysis (3 Credit Hours)**

GIS can be used to answer complex questions about space using the logical connection between attribute data and map features and the analytical tools incorporated in GIS software. Applications include attribute and spatial queries on single and multiple layers, analysis of spatial point patterns, network analysis, surface and raster based analyses, and the construction of explanatory and predictive models. This class will cover the basics of spatial analysis including defining the problem in spatial terms, selecting appropriate data structures, understanding and utilizing spatial tools, conceptualizing and implementing models, interfacing with related technologies, and conveying model results through cartographic output and report generation.

May be repeated for credit. *Equivalent to BIO 364, ENV 364.*

**Academic Level:** Undergraduate

**Corequisites:** GIS 364L

**GIS 364L Spatial Analysis Lab (1 Credit Hours)**

In this laboratory course students will apply advanced GIS analytical tools to address attribute and spatial queries on single and multiple layers, analyze spatial point patterns, conduct network, surface and raster based analyses, construct explanatory and predictive models, and convey model results through cartographic output and report generation.

**Academic Level:** Undergraduate

**Corequisites:** GIS 364

**GIS 398 Special Topics (without Lab) (3 Credit Hours)**

This course offers an in-depth study of a topic in the fields of GIS. The course builds upon prior knowledge and skills attained in other GIS courses. It may be taken more than once as the topic changes. Topics include but are not limited to the use of unoccupied aerial vehicles, GPS/GNSS, GIS in health sciences, urban planning, etc.

May be repeated for credit.

**Academic Level:** Undergraduate

**GIS 399 Special Topics (with Lab) (4 Credit Hours)**

This course offers an in-depth study of a topic in the fields of GIS with laboratory experience. The course builds upon prior knowledge and skills attained in other GIS courses and includes field work. It may be taken more than once as the topic changes. Topics include but are not limited to the use of unoccupied aerial vehicles, GPS/GNSS, GIS in health sciences, urban planning, etc.

May be repeated for credit.

**Academic Level:** Undergraduate

**Corequisites:** GIS 399L

**GIS 399L Special Topics Lab**

In this laboratory course students will apply knowledge of GIS concepts to solve geospatial problems.

May be repeated for credit.

**Academic Level:** Undergraduate

**Corequisites:** GIS 399

**GIS 410 GIS Research (1-12 Credit Hours)**

This course is for advanced GIS minors who may wish to undertake directed research as a special course in fulfilling the minor requirements.

A carefully prepared written plan must be presented and approved by the associated faculty with whom the research will be conducted and Assistant Academic Director or Academic Director of SMEP.

May be repeated for credit.

**Academic Level:** Undergraduate

Enrollment limited to students with the UG Research attribute.

**GIS 495 GIS Internship (3-12 Credit Hours)**

An internship is a high impact learning experience where knowledge and theory from students' program of study are integrated with shadowing, volunteering, or paid employment with a private company, not-for-profit organization or government agency toward the intentional development of transferable knowledge, skills and abilities and practical application of professional competencies. The semester prior to the internship, Academic and Career Advising Center staff assist students with preparing their application materials and searching and applying for GIS-related internships within the local community, stateside or abroad, as well as in defining learning objectives, educational and career goals, and professional deliverables to be met throughout the course of training and practice. During the semester of the internship course, under the mentorship of a dedicated professional who has the education and/or background and expertise of the students' discipline of study, students immerse in a remote, hybrid or in-person professional setting. Through guidance, support and regular feedback from the mentor and internship course instructor, students strive to satisfactorily learn and practice their internship position and achieve their learning objectives. Students follow a course curriculum including: 40 contact hours at the host site per credit hour registered; participation in classes, meetings or workshops as scheduled by the course instructor; timely completion of homework assignments in support of student learning outcomes, professional readiness and career exploration; and end of semester evaluations. Internships culminate in a letter grade determined by the above criteria. Written pre-approval of the internship by the course instructor and Academic Director is required.

May be repeated for credit.

**Academic Level:** Undergraduate

Enrollment limited to students with the UG Internships attribute.

**GIS 524 Remote Sensing (3 Credit Hours)**

Remote sensing is a group of techniques for collecting information about an object and its surroundings without any physical contact. In this course we concentrate on aerial photography and satellite measurements, with some discussion of sonar, radar and other techniques. Students will learn how to acquire and manipulate data, and how to extract information from imagery. Application of these techniques to environmental monitoring, oceanography, agriculture, resource management, archeology and other disciplines will form the basis of the course. Students will learn computer software that aids in processing and analyzing large images from satellites and aerial platforms. They also will gain insight on using how remote sensing interfaces with Geographic Information Systems (GIS). The power of these systems is in their ability to analyze complex spatial information. The classroom and lab sessions are taught in the computer laboratory with portions of time being devoted to theory, followed by application using remote sensing data. Students are expected to combine their research interests in their field to expand and enhance course work. Students will complete an original final project that can be integrated into their thesis research.

**Academic Level:** Graduate

**GIS 524L Remote Sensing Lab (1 Credit Hours)**

Remote sensing is a group of techniques for collecting information about an object and its surroundings without any physical contact. In this course we concentrate on aerial photography and satellite measurements, with some discussion of sonar, radar and other techniques. Students will learn how to acquire and manipulate data, and how to extract information from imagery. Application of these techniques to environmental monitoring, oceanography, agriculture, resource management, archeology and other disciplines will form the basis of the course. Students will learn computer software that aids in processing and analyzing large images from satellites and aerial platforms. They also will gain insight on using how remote sensing interfaces with Geographic Information Systems (GIS). The power of these systems is in their ability to analyze complex spatial information. The classroom and lab sessions are taught in the computer laboratory with portions of time being devoted to theory, followed by application using remote sensing data. Students are expected to combine their research interests in their field to expand and enhance course work. Students will complete an original final project that can be integrated into their thesis research.

**Academic Level:** Graduate

**Corequisites:** GIS 524

**GIS 525 Remote Sensing (4 Credit Hours)**

Remote sensing is a group of techniques for collecting information about an object and its surroundings without any physical contact. In this course we concentrate on aerial photography and satellite measurements, with some discussion of sonar, radar and other techniques. Students will learn how to acquire and manipulate data, and how to extract information from imagery. Application of these techniques to environmental monitoring, oceanography, agriculture, resource management, archeology and other disciplines will form the basis of the course. Students will learn computer software that aids in processing and analyzing large images from satellites and aerial platforms. They also will gain insight on using how remote sensing interfaces with Geographic Information Systems (GIS). The power of these systems is in their ability to analyze complex spatial information. The classroom and lab sessions are taught in the computer laboratory with portions of time being devoted to theory, followed by application using remote sensing data. Students are expected to combine their research interests in their field to expand and enhance course work. Students will complete an original final project that can be integrated into their thesis research.

May be repeated for credit.

**Academic Level:** Graduate, Undergraduate

**Corequisites:** GIS 525L

Enrollment is limited to Graduate level students.

**GIS 525L Remote Sensing Lab**

This lab constitutes the hands-on component of GIS 525.

May be repeated for credit.

**Academic Level:** Graduate, Undergraduate

Enrollment is limited to Graduate level students.

**GIS 564L Spatial Analysis Lab (1 Credit Hours)**

In this laboratory course students will apply advanced GIS analytical tools to address attribute and spatial queries on single and multiple layers, analyze spatial point patterns, conduct network, surface and raster based analyses, construct explanatory and predictive models, and convey model results through cartographic output and report generation.

**Academic Level:** Graduate

**Corequisites:** GIS 564

**GIS 598 Special Topics in GIS (3 Credit Hours)**

This graduate-level course offers an in-depth study of a topic related to the application of GIS technologies. This advanced course builds upon the student's prior GIS knowledge and skills and incorporates techniques relevant to the graduate student's research interest. Topics include but are not limited to the use of unoccupied aerial vehicles, GPS/GNSS, GIS in health sciences, urban planning, etc. This course may be taken as an elective for graduate curriculum and can be repeated for different special topics.

May be repeated for credit.

**Academic Level:** Graduate

Enrollment is limited to Graduate level students.

**GIS 599 Special Topics in GIS (4 Credit Hours)**

This course offers an in-depth study of a topic in the fields of GIS at the graduate level. The course builds upon prior knowledge and skills attained in other GIS courses. It may be taken more than once as the topic changes. Topics include but are not limited to the use of unoccupied aerial vehicles, GPS/GNSS, GIS in health sciences, urban planning, etc.

**Academic Level:** Graduate

**GIS 599L Special Topics in GIS Lab**

In this laboratory course students will apply knowledge of GIS concepts to solve geospatial problems at the graduate level.

**Academic Level:** Graduate