

# GIS-GEOGRAPHIC INFORMATION SCIENCE

## GIS 1313 Computers and Programs for Environmental Professionals 3 Credit Hours

This course covers Microsoft Office software, various computer literacy skills, Python and briefly R programming languages that will help prepare students for future environmental and GIS course work and careers. Topics include data management techniques, logical file/folder structures, Python programming tasks, safety procedures when downloading materials, geographical applications of programming, constructing "for" loops and conditional statements, and utilizing backup storage. (F)

## GIS 2023 Introduction to Spatial Thinking and Computer Mapping 3 Credit Hours

Facilitates the effective communication of geographic information through sound cartographic principles and techniques. Introduces students to geographic information literacy, spatial perspectives on information management, and the use of maps as a communication tool. (Sp)

## GIS 2970 Special Topics 1-3 Credit Hours

Special Topics. 1 to 3 hours. May be repeated; Maximum credit nine hours. Special topics course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research, and field projects. (Irreg.)

## GIS 3003 Computer Cartography and Geovisualization 3 Credit Hours

Prerequisite: ENGL 1213/EXPO 1213 and GIS 2023. This course is designed to help students learn the theory and the practical applications of map design, with a focus on current methods for visualizing spatial data and introduces the latest cutting-edge data visualization techniques. The course covers a variety of topics but focuses on both traditional map elements but also includes modern advancements in visualization. (F, Sp)

## GIS 3440 Mentored Research Experience 3 Credit Hours

0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

## GIS 3960 Honors Reading 1-3 Credit Hours

1 to 3 hours. Prerequisite: Admission to Honors Program. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. The topics will cover materials not usually presented in the regular courses. (F, Sp, Su)

## GIS 3970 Honors Seminar 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Subjects covered vary. Deals with concepts not usually treated in regular courses. (Irreg.)

## GIS 3980 Honors Research 1-3 Credit Hours

1 to 3 hours. Prerequisite: Admission to Honors Program. May be repeated; maximum credit six hours. Will provide an opportunity for the gifted Honors candidate to work at a special project in the student's field. (F, Sp, Su)

## GIS 3990 Independent Study 1-3 Credit Hours

1 to 3 hours. Prerequisite: permission of instructor and junior standing. May be repeated once with change of content. Independent study may be arranged to study a subject not available through regular course offerings. (F, Sp, Su)

## GIS 4013 Fundamentals of Geographic Information Systems 3 Credit Hours

(Slashlisted with GIS 5013) Prerequisite: GIS 2023. Designed to help students learn introductory to intermediate concepts of geographic information science (GIScience) and become proficient users of geographic information systems (GIS). The course covers a variety of topics but focuses on GIS data models, data structures, and spatial analysis. Teaching formats include lectures, in-class exercises and lab exercises. No student may earn credit for both 4013 and 5013. (F, Sp)

## GIS 4133 Fundamentals of Remote Sensing 3 Credit Hours

(Slashlisted with GIS 5133) Prerequisite: Junior standing or permission of instructor. An introduction to the basic principles of remote sensing, image acquisition, image processing, image interpretation, and its geographic and environmental applications. Labs involve the processing of satellite, airborne, and other geospatial data in an open-source cloud computing platform to explore the concepts taught in lectures. No student may earn credit for both 4133 and 5133. (F)

## GIS 4173 Drones and Remote Sensing 3 Credit Hours

(Slashlisted with GIS 5173) Prerequisite: GIS 4133; junior standing. This course will explore remote sensing fundamentals, drone technology, data acquisition, image processing, and integration of these technologies for environmental monitoring, disaster management, agricultural applications, urban planning, and more. Students will gain the skills necessary to operate drones, process remote sensing data, and apply these tools to real-world problem solving. No student may earn credit for both 4173 and 5173. (F)

## GIS 4200 Internship in Geoinformatics 1-6 Credit Hours

1 to 6 hours. Prerequisite: junior standing and permission of instructor. May be repeated; maximum credit six hours. Provides career training experience whereby students may apply geoinformatics skills and further develop professional capabilities in a realistic setting. Students will be assigned to private industry, government agencies or educational institutions on an individual basis and report on their experience to the instructor. (F, Sp, Su)

## GIS 4233 Digital Image Processing 3 Credit Hours

(Slashlisted with 5233) Prerequisite: Grade of C or better in 4133 or permission of instructor. Theory and techniques for computer processing (digital image processing or DIP) of digital earth resources satellite imagery and incorporation into geographic information systems. No student may earn credit for both 4233 and 5233. (Sp)

## GIS 4243 Remote Sensing Applications 3 Credit Hours

(Slashlisted with GIS 5243) Prerequisite: GIS 4133; junior standing. This course is designed to build on the Fundamentals of Remote Sensing towards helping students develop a strong understanding of the tools and techniques used to display, process, and analyze remotely sensed data. Students will learn how to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. No student may earn credit for both 4243 and 5243. (F, Sp)

- GIS 4253 GIS Applications 3 Credit Hours**  
(Slashlisted with GIS 5253) Prerequisite: GIS 4013. Designed to help students learn intermediate and advanced concepts of geographic information science related to a variety of socio-economic and environmental fields. Course topics may include: landscape ecology and metrics; suitability modeling; binary and ranking index models; routing and network analysis; and other topics applicable to social or environmental fields. Teaching formats include both lectures and lab exercises. No student may earn credit for both 4253 and 5253. (Sp)
- GIS 4453 Advanced GIS and Spatial Analysis 3 Credit Hours**  
(Slashlisted with GIS 5453) Prerequisite: GIS 2023 and GIS 4013 and GIS 4253, CS 1313 or CS 1323 or METR 1313 or MIS 3013, and upper-division standing; or permission of instructor. Expands and solidifies the GIS knowledge acquired in introductory and applied GIS classes. Focuses on highly complex geographic questions which cannot be solved in simple steps but instead require advanced GIS analysis and sometimes automation. The course is intended to prepare the student for a professional GIS position in the government or business world, or a higher-level graduate position. No student may earn credit for both 4453 and 5453. (Sp)
- GIS 4553 Advanced Remote Sensing 3 Credit Hours**  
(Slashlisted with GIS 5553) Prerequisite: GIS 4133; junior standing. This course will introduce students to advanced topics in digital remote sensing towards understanding the theoretical and conceptual underpinnings in both aerial and satellite remote sensing. Focus will be placed on advanced active and passive sensors characteristics, digital image analysis, and processing for advanced issues in remote sensing, including new frontiers in the discipline. No student may earn credit for both 4553 and 5553. (F, Sp)
- GIS 4653 Spatial Programming and GIS 3 Credit Hours**  
(Slashlisted with GIS 5653) Prerequisite: GIS 4013, upper-division standing or permission of instructor. Introduces students to geocomputation concepts, spatial programming skills and computational approaches to spatial data services and spatial problem solving. No student can earn credit for both 4653 and 5653. (F)
- GIS 4733 Environmental Remote Sensing 3 Credit Hours**  
(Slashlisted with GIS 5733; Crosslisted with P BIO 4733) Prerequisite: either a course or hands-on experience in remote sensing, GIS, statistical analysis, computer programming, or permission of the instructor and adviser. Course develops comprehensive knowledge and advanced skills of remote sensing, to apply to the study of the structure, composition, and functions of vegetation, landscapes, and the biosphere. Students will learn hyperspectral data acquisition and analysis; field survey methods; land cover classification from multiple sensors, time series data; and estimation of biophysical and biochemical parameters. Includes image processing software and algorithms. No student may earn credit for both 4733 and 5733. (Sp)
- GIS 4833 Environmental Spatial Modeling 3 Credit Hours**  
(Slashlisted with GIS 5833) Prerequisite: Junior standing and GIS 2023. This course covers an introduction to decision-making techniques about land use allocation and planning. Lectures and lab/discussion sections will focus on addressing conflicts involving environmental concerns and multiple objectives. Examples include water resources development, corridor location (e.g., rights-of-way for transmissions, roads, etc.), preservation of endangered species, power plant siting, and others. No student may earn credit for both 4833 and 5833. (Sp)
- GIS 4923 Spatial Statistics 3 Credit Hours**  
(Slashlisted with GIS 5923) Prerequisite: GEOG 3924, CS 1313 or CS 1323 or METR 1313 or MIS 3013, and upper-division standing; or permission of instructor. Explains and demonstrates methods and techniques in spatial sampling; spatial auto-correlation and spatial composition. It also delves into spatially adjusted regression, local statistics, and geo-statistics and related techniques. Theoretical explanations and derivations as well as practical applications making use of both ArcGIS and R. No student may earn credit for both 4923 and 5923. (Irreg.)
- GIS 4960 Directed Readings 1-4 Credit Hours**  
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)
- GIS 4970 Special Topics/Seminar 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: Senior standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- GIS 4990 Independent Study 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: Senior standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)
- GIS 5003 Spatial Data Management for GIS Professionals 3 Credit Hours**  
Prerequisite: Graduate standing. The goal of this course is to develop introductory computer science skills and information management literacy for GIS professionals finding work in industry. Students will learn how to capture, create, validate, and maintain spatial data for use in a professional GIS setting, and become familiar navigating federal, local, and private online GIS data repositories for future GIS work. (F, Sp)
- GIS 5013 Fundamentals of Geographic Information Systems 3 Credit Hours**  
(Slashlisted with GIS 4013) Prerequisite: graduate standing. Designed to help students learn introductory to intermediate concepts of geographic information science (GIScience) and become proficient users of geographic information systems (GIS). The course covers a variety of topics but focuses on GIS data models, data structures, and spatial analysis. Teaching formats include lectures, in-class exercises and lab exercises. No student may earn credit for both 4013 and 5013. (F, Sp)
- GIS 5133 Fundamentals of Remote Sensing 3 Credit Hours**  
(Slashlisted with GIS 4133) Prerequisite: Graduate standing or permission of instructor. An introduction to the basic principles of remote sensing, image acquisition, image processing, image interpretation, and its geographic and environmental applications. Labs involve the processing of satellite, airborne, and other geospatial data in an open-source cloud computing platform to explore the concepts taught in lectures. No student may earn credit for both 4133 and 5133. (F)

- GIS 5173 Drones and Remote Sensing 3 Credit Hours**  
(Slashlisted with GIS 4173) Prerequisite: GIS 4133 or GIS 5133; graduate standing or permission of instructor. This course will explore remote sensing fundamentals, drone technology, data acquisition, image processing, and integration of these technologies for environmental monitoring, disaster management, agricultural applications, urban planning, and more. Students will gain the skills necessary to operate drones, process remote sensing data, and apply these tools to real-world problem solving. No student may earn credit for both 4173 and 5173. (F)
- GIS 5233 Digital Image Processing 3 Credit Hours**  
(Slashlisted with 4233) Prerequisite: Graduate standing and a grade of C or better in GIS 4133 or GIS 5133 or permission of instructor. Theory and techniques for computer processing (digital image processing or DIP) of digital earth resources satellite imagery and incorporation into geographic information systems. No student may earn credit for both 4233 and 5233. (Sp)
- GIS 5243 Remote Sensing Applications 3 Credit Hours**  
(Slashlisted with GIS 4243) Prerequisite: GIS 4133 or GIS 5133; graduate standing. This course is designed to build on the Fundamentals of Remote Sensing towards helping students develop a strong understanding of the tools and techniques used to display, process, and analyze remotely sensed data. Students will learn how to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. No student may earn credit for both 4243 and 5243. (F, Sp)
- GIS 5253 GIS Applications 3 Credit Hours**  
(Slashlisted with GIS 4253) Prerequisite: graduate standing, GIS 5013. Designed to help students learn intermediate and advanced concepts of geographic information science related to a variety of socio-economic and environmental fields. Course topics may include: landscape ecology and metrics; suitability modeling; binary and ranking index models; routing and network analysis; and other topics applicable to social or environmental fields. Teaching formats include both lectures and lab exercises. No student may earn credit for both 4253 and 5253. (Sp)
- GIS 5453 Advanced GIS and Spatial Analysis 3 Credit Hours**  
(Slashlisted with GIS 4453). Prerequisite: GIS 5013 and GIS 5253, graduate standing. Expands and solidifies the GIS knowledge acquired in introductory and applied GIS classes. Focuses on highly complex geographic questions which cannot be solved in simple steps but instead require advanced GIS analysis and sometimes automation. The course is intended to prepare the student for a professional GIS position in the government or business world, or a higher-level graduate position. No student may earn credit for both 4453 and 5453. (Sp)
- GIS 5553 Advanced Remote Sensing 3 Credit Hours**  
(Slashlisted with GIS 4553) Prerequisite: GIS 5133; graduate standing. This course will introduce students to advanced topics in digital remote sensing towards understanding the theoretical and conceptual underpinnings in both aerial and satellite remote sensing. Focus will be placed on advanced active and passive sensors characteristics, digital image analysis, and processing for advanced issues in remote sensing, including new frontiers in the discipline. No student may earn credit for both 4553 and 5553. (F, Sp)
- GIS 5653 Spatial Programming and GIS 3 Credit Hours**  
(Slashlisted with GIS 4653) Prerequisite: graduate standing and GIS 4013/GIS 5013. Introduces students to geocomputation concepts, spatial programming skills, and computational approaches to spatial data services and spatial problem solving. No student may earn credit for both 4653 and 5653. (F)
- GIS 5733 Environmental Remote Sensing 3 Credit Hours**  
(Slashlisted with GIS 4733; Crosslisted with P BIO 5733) Prerequisite: graduate standing, and either a course or hands-on experience in remote sensing, GIS, statistical analysis, computer programming, or permission of the instructor and adviser. Course develops comprehensive knowledge and advanced skills of remote sensing, to apply to the study of the structure, composition, and functions of vegetation, landscapes, and the biosphere. Students will learn hyperspectral data acquisition and analysis; field survey methods; land cover classification from multiple sensors, time series data; and estimation of biophysical and biochemical parameters. Includes image processing software and algorithms. No student may earn credit for both 4733 and 5733. (Sp)
- GIS 5833 Environmental Spatial Modeling 3 Credit Hours**  
(Slashlisted with GIS 4833) Prerequisite: Graduate standing. This course covers an introduction to decision-making techniques about land use allocation and planning. Lectures and lab/discussion sections will focus on addressing conflicts involving environmental concerns and multiple objectives. Examples include water resources development, corridor location (e.g., rights-of-way for transmissions, roads, etc.), preservation of endangered species, power plant siting, and others. No student may earn credit for both 4833 and 5833. (Sp)
- GIS 5923 Spatial Statistics 3 Credit Hours**  
(Slashlisted with GIS 4923) Prerequisite: graduate standing; it is recommended that students have taken an introductory statistics course. Explains and demonstrates methods and techniques in spatial sampling, spatial auto-correlation, and spatial composition. It also delves into spatially-adjusted regression, local statistics, geo-statistics, and related techniques. Theoretical explanations and derivations as well as practical applications, making use of both ArcGIS and R. No student may earn credit for both 4923 and 5923. (Irreg.)
- GIS 5960 Directed Readings 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member. (F, Sp, Su)
- GIS 5970 Special Topics/Seminar 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: Graduate standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- GIS 5980 Research for Master's Thesis 2-9 Credit Hours**  
Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)
- GIS 5990 Independent Study 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)
- GIS 6960 Directed Readings 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours Directed readings and/or literature review under the direction of a faculty member. (Irreg.)
- GIS 6970 Special Topics/Seminar 1-3 Credit Hours**  
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit 12 hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or research and field projects. (Irreg.)

**GIS 6980 Research for Doctoral Dissertation 2-16 Credit Hours**

2 to 16 hours. Prerequisite: Graduate standing and permission of instructor; may be repeated. Directed research culminating in the completion of the doctoral dissertation. (F, Sp, Su)

**GIS 6990 Independent Study 1-3 Credit Hours**

1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)