GEOGRAPHIC INFORMATION SCIENCE (GISCIENCE), CERTIFICATE

Certificate in Geographic Information Science (GIScience)

Program Director: Bobak Karimi, Ph.D.

The Certificate in Geographic Information Science (GIScience) at Wilkes University is designed so that students can gain knowledge and skills using up-to-date techniques to solve real-world geospatial problems. Courses are designed to be offered online, or as hybrid/hybrid-flexible, with hands-on and experiential learning at the core of the curriculum. Contextual learning is to be encouraged by elective courses.

The Certificate in GIScience is constructed around GISP certification using the Geographic Information Systems Certification Institute's (GISCI) technical knowledge exam content as a roadmap for additional course/content.

To earn the certificate students must complete the following course series:

INTRODUCTORY TRACK (15 credits; minimum of 2.0 required in all courses; see table for curriculum)

This track is designed for current and/or aspiring geospatial specialists who want to become well-versed in Geographic Information Science (GIScience) and skillful users of software and technology relevant to Geographic Information Systems (GIS). This track is suitable for students enrolled in a baccalaureate program at Wilkes University, or elsewhere, as well as industry and community participants with no baccalaureate degree. NOTE: GIS-271 is listed as a general education Area II course. It is 3-credits and has a lab. Students currently enrolled at Wilkes University full-time can take this course towards satisfying Area II requirements. All GIS courses are listed as computer intensive (CI) courses. Students currently enrolled at Wilkes University full-time can take any two CI courses in place of computer science general education requirements – per general education guidelines. Students would need to have this deviation from their normal curriculum approved by the chair of their home department.

- [[GIS-271]] - Introduction to GPS & GIS
- [[GIS-272]] - Advanced GIS & Remote Sensing
- [[GIS-301]] - GIS Applications & Colloquia
- Electives

Course	Course Title	Short Description	Credits	Modality	Activity Hours
GIS-271 (CI)	Introduction to GPS & GIS	Theory and practice of GPS and fundamentals of GIS and Cartography.	3	Hybrid	3
GIS-272 (CI)	Advanced GIS & Remote Sensing	Advanced GIS topics including geostatistics, surface analysis and 3D modeling, and basics of Remote Sensing. Prerequisite: GIS-271, or permission from the instructor.	3	Hybrid	3
GIS-301 (CI)	GIS Applications	Learning to solve real-word problems with GIS. Prerequisite: GIS-272, or permission from the instructor.	3	Hybrid-Flex	3
Electives	Elective Courses	Choose elective courses from an approved list.	6	N/A	N/A

ADVANCED TRACK (15 credits; minimum of 2.0 required for all courses; see table for curriculum)

Intended for post-baccalaureate or other learners with some GIScience experience, this track is designed to enhance knowledge in GIScience by allowing students to gain in-depth GIScience knowledge through advanced courses appropriate to the student's level and focus. Enrollment to this track requires permission from the director of the Center for Geographic Information Science, and students must show proficiency of requisite knowledge/coursework to waive GIS-271 and/or GIS-272.

- [[GIS-271]] - Introduction to GPS & GIS
- [[GIS-272]] - Advanced GIS & Remote Sensing
- [[GIS-301]] - GIS Applications & Colloquia
- Electives

Course	Course Title	Short Description	Credits	Modality	Activity Hours

GIS-271 (CI)	Introduction to GPS & GIS	Theory and practice of GPS and fundamentals of GIS and Cartography. *Students may have this course waived with permission by the director of the Center for GIScience. If waived, students must complete an additional GIS 3-credit elective in its place.	3	Hybrid	3
GIS-272 (CI)	Advanced GIS & Remote Sensing	Advanced GIS topics including geostatistics, surface analysis and 3D modeling, and basics of Remote Sensing. Prerequisite: GIS-271, or permission from the instructor. *Students may have this course waived with permission by the director of the Center for GIScience. If waived, students must complete an additional GIS 3-credit elective in its place.	3	Hybrid	3
GIS-301 (CI)	GIS Applications	Learning to solve real-word problems with GIS. Prerequisite: GIS-272, or permission from the instructor.	3	Hybrid-Flex	3
Electives	Elective Courses	Choose elective courses from an approved list.	6	N/A	N/A

Degree Requirements

The program requires 15-credits for completion, a minimum of 2.0 in each course, and includes 3 fundamental foundation courses (GIS-271/GIS-272/GIS-301) in addition to two upper-level GIS and/or interdisciplinary electives. Students can select from two available tracks: introductory or advanced. The introductory track is designed specifically for those who have little to no background/experience with GIScience, which would include Wilkes University students, as well as undergraduates at other institutions, such as those the University has agreements with for cross-registration. The advanced track is designed for those with existing, but limited knowledge (such as industry professionals and postbaccalaureate students). Additionally, the proposed program allows currently enrolled students to easily incorporate the certificate program into their studies.

GIS. GEOGRAPHIC INFORMATION SCIENCE

GIS-298/398. TOPICS IN GEOGRAPHIC INFORMATION SCIENCE
Credits: Varies with topic studied.

Course on GIS topics of special interest, not extensively treated in regularly scheduled offerings, will be presented under this course number on an occasional basis. May be repeated for credit.

Pre-Requisites

Varies with topic studied.

Co-Requisites

Varies with topic studied.

GIS-271. INTRODUCTION TO GPS & GIS
Credits: 3
Fees: $120

An introduction to Global Positioning Systems (GPS), Geographic Information Systems (GIS), and geospatial mapping concepts and applications. Topics include coordinate systems, reference ellipsoids, geodetic datums, map projections, history of GIS, relational database management, quality control, GIS as a decision support tool, and data manipulation, processing, and analysis. Practical field use of GPS is emphasized within the context of understanding system components, satellite signal processing, selective availability, base station differential correction, and data export to GIS. Geospatial data science is discussed within the context of real-world locational phenomena. This course it designated as computer intensive (CI). Two hours of lecture and three hours of lab per week.

GIS-272. ADVANCED GIS & REMOTE SENSING
Credits: 3
Fees: $120

An advanced course on Geographic Information Systems (GIS) and Remote Sensing. GIS topics build upon introductory-level coursework in GIS 271, and introduce more advanced applications of GIS software such as density mapping and interpolation of point data (geostatistical methods), surface analysis and 3D modeling of geospatial data, open source alternatives to ArcGIS, and web map design and development design. Remote sensing topics include aerial and satellite visual imagery, digital image processing, photogrammetry, Light Detection and Ranging (LiDAR), and multispectral remote sensing systems and theory. The course will also include case studies of remote sensing and GIS techniques applied in a variety of studies. Field use of GPS is emphasized, in addition to the use of small Unmanned Aerial Systems (sUAS) to capture aerial digital imagery. Laboratory component emphasizes practical skills and tools in achieving desired results in processing geospatial data, particularly raster data types. This course it designated as computer intensive (CI). Two hours of lecture and three hours of lab per week.

Pre-Requisites

[[GIS-271]], or permission of the instructor.

GIS-301. GIS APPLICATIONS & COLLOQUIA
Credits: 3
Fees: $120

This course will further explore fundamental and advanced GIScience topics through solving real-world problems. It will provide a practical, hands-on approach to learning about GIS applications for a selection of different fields such as security, criminology, business/marketing, human and health services, epidemiology, environmental systems, geology, political science, natural resources, urban planning, and agriculture, among others. Additionally, the course includes a colloquia component (required for students enrolled in the course), where students will have the opportunity to industry and academic experts in GIScience applications to various fields. The colloquia component would also be open to the public. This course it designated as computer intensive (CI). Three hours of lecture per week.

Pre-Requisites

[[GIS-272]] or permission of the instructor.

GIS-310. GIS PROGRAMMING AND CUSTOMIZATION
Credits: 3
Fees: $120

The course introduces students to methods of solving geospatial problems by creating automated Geographic Information System (GIS) software through programming. Python programming language – with its simple syntax and powerful set of libraries – will be used to write and edit scripts that add functionality to existing GIS desktop tools and to automate geospatial analytic processes. No previous programming experience is required. Python programming topics will include object-oriented programming, object model diagrams, loops, if-then statements, and modular code design within the context of geospatial analytics and workflows to solve geospatial problems. This course it designated as computer intensive (CI). Two hours of lecture and three hours of lab per week equivalent.

Pre-Requisites

[[GIS-271]], or permission of the instructor.

GIS-315. WEB GIS
Credits: 3
Fees: $120

In this course, students will have hands-on experience creating web applications with interactive maps combining different types of geospatial data. The fundamental technology behind web maps – including capabilities and limitations – will be explained, including relevant geospatial systems, server software, data sources, and web development languages (i.e., HTML, CSS, JavaScript). No prior programming language experience is needed for this course. Students will gain valuable experience in creating web GIS applications, and will be ready to apply their knowledge in academic and professional fields. This course it designated as computer intensive (CI). Two hours of lecture and three hours of lab per week equivalent.

Pre-Requisites

[[GIS-271]], or permission of the instructor.

GIS-320. INTRODUCTION TO GEOSPATIAL MODELING
Credits: 3
Fees: $120

This course introduces how GIS can be used to construct and simulate dynamic models of geospatial phenomena, which involve variation over space and/or time. This course provides foundations on geospatial modeling, and an understanding of various issues related to geospatial modeling and simulation. Students will learn concepts, tools, and techniques commonly used in GIS modeling, including approaches from continuous representation of system dynamics to the discrete interactions of individual, agent-based models. This course it designated as computer intensive (CI). Two hours of lecture and three hours of lab per week.

Pre-Requisites
[[MTH-150]] or higher, [[GIS-272]], or permission of the instructor.