Geographic Information Systems Certificate

Contact:	Dorris Scott
Phone:	314-935-5498
Email:	d.scott@wustl.edu
Website:	http://caps.wustl.edu/programs/certificates/geographic-information-systems

Courses

CAPS-GIS 2000 Introduction to GIS
This course introduces students to the fundamental principles and applications of geographic information systems (GIS), their underlying geospatial science and spatial thinking. This problem-based course explores applications of GIS to spatial questions in the areas of social science, business, the humanities and earth sciences. Example topics include understanding spatial data types; map coordinate systems and projections; basic spatial data analysis; acquiring, editing, creating and managing geospatial data; and processing and visualizing data using GIS. This hands-on course works through problems using ESRI ArcGIS software (primarily ArcGIS Pro), but other open source tools will also be introduced. Students who complete this course should be able to apply skills to think through a spatial problem and employ GIS tools to address it.
Credit 3 units.
Typical periods offered: Summer 4, Summer 3, Summer 2, Summer 1, Summer, Spring, Fall

CAPS-GIS 2005 GIS Bootcamp
This course introduces basic GIS concepts, digital cartography, and common geoprocessing tasks. The course includes hands-on exposure to GIS using ArcGIS Online. Students will gain experience in map creation, finding and downloading GIS datasets and conducting basic spatial analysis. If students are curious about GIS and want to know how this technology is used in many commercial and scientific disciplines every day, this course is for them.
Credit 1 unit.
Typical periods offered: Summer

CAPS-GIS 3000 Advanced GIS
This course is designed to move beyond fundamental data presentation and map production skills. Primary emphasis will be on applying fundamental GIS concepts, performing spatial analysis, developing proficiency with GIS software applications, resolution of problems, and efficient delivery of results. A semester project will provide experience in the planning and execution of real-world projects using geospatial technology. Course objectives include applying fundamental GIS concepts, performing spatial analysis, developing proficiency with core ArcGIS software and selected extensions, resolution of problems, and efficient delivery of results. Completion of an introductory level GIS course is a prerequisite.
Credit 3 units.
Typical periods offered: Summer 4, Summer 3, Summer 2, Summer 1, Summer, Spring, Fall

CAPS-GIS 3005 Digital Cartography
In today's world, it is imperative that students develop the necessary skills to communicate their ideas to a large audience in an efficient manner. Graphics and visual representations are one of the most effective ways to neatly convey complex data sets to readers. This course presents both theoretical and hands-on mapping and graphical problems to students. Students will learn to solve these problems with self-created solutions. The course teaches students the basics of GIS-based mapping for producing publishable work. Students will develop basic skills in computer-aided mapping and computer drafting primarily using the ArcGIS Suite of desktop software, ArcGIS and Google online web mapping, and other tools. Students will also be introduced to other mapping or statistical programs as needed.
Credit 3 units.
Typical periods offered: Summer 4, Summer 3, Summer 2, Summer 1, Summer, Spring, Fall

CAPS-GIS 3010 GIS Programming
This course introduces students to the use of programming in desktop and web geographic information systems (GIS). The course will be divided into two units: the first unit will focus on scripting for task automation, while the focus of the second unit will be web development. Topics include general programming concepts, using spatial libraries for both Python and R, the ArcGIS API for JavaScript, Leaflet, and consuming and publishing map services. Prerequisite: Introduction to GIS (U90 GIS 200) or Applications of GIS (EnSt 380/580).
Credit 3 units.
Typical periods offered: Spring

CAPS-GIS 4000 Applications in Geospatial Intelligence
This course introduces the concept of geospatial intelligence (GEOINT) and demonstrates how location can be used to identify patterns, visualize connections, and define relationships to ultimately see what others can't. Learn about the Intelligence Cycle, the mission of the National Geospatial-Intelligence Agency (NGA) and other members of the Intelligence Community (IC), as well as potential career pathways in GEOINT. Students will learn how to leverage GIS to solve problems and make decisions related to Intelligence. This course features both a theoretical understanding provided by subject matter experts (SME) from the industry, as well as a practical understanding through hands-on exercises using ArcGIS Pro Intelligence and other Esri software applications.
Credit 3 units.
Typical periods offered: Summer 4, Summer 3, Summer 2, Summer 1, Summer, Spring, Fall

CAPS-GIS 4010 Spatial Data Modeling and Design
This course expands on the fundamental principles of geographic information systems (GIS) and introduces advanced spatial database concepts and a visual programming environment for automating geoprocessing tasks. The course is divided into two parts: the first exploring spatial database design with emphasis on the ESRI Geodatabase, and the second focusing on automating workflows using ESRI ModelBuilder. Topics include data needs assessment; conceptual modeling, logical design, and physical implementation; using models to perform multi-step spatial analyses; and the automation of repetitive processes with iteration tools. Lectures are supplemented with lab exercises to develop proficiency and problem-solving skills using ArcGIS software and associated tools. Prerequisite: the course should be taken after or concurrently with Advanced GIS (U90 GIS 300).
Credit 3 units.
Typical periods offered: Fall

CAPS-GIS 4015 GIS Clinic

The GIS Clinic places students in real work settings to provide direct experience with geospatial concepts and data. Students apply concepts and tools covered in all courses comprising the GIS Certificate program. GIS Clinic requires students to work on projects beginning to end, under supervision, and independently. The Clinic provides professional services to the University Community as well as outside organizations. Possible clinic settings include working with faculty on research projects using GIS, working with local organizations to develop GIS data, and working on regional GIS initiatives. Prerequisite: All other GIS Certificate requirements are expected to be completed prior to enrolling in the Clinic.

Credit 3 units.

Typical periods offered: Summer 4, Summer 3, Summer 2, Summer 1, Summer, Spring, Fall

---

CAPS-GIS 4035 Applications in Imagery Analysis

This course exposes students to the range of applications of imagery analysis. Topics will include remote sensing concepts and instrumentation; the history of aerial photography and satellite remote sensing; and common techniques and workflows used to prepare and perform such tasks as digital imagery processing, imagery classification, and change detection. Furthermore, students will be introduced to industry applications and learn about the remote sensing job market. Students will perform hands-on lab activities to reinforce the concepts covered in lectures and readings. Students will also have the chance to interact with professionals in the field through guest lectures. Most activities will be performed using ArcGIS Pro software and extensions.

Credit 3 units.

Typical periods offered: Fall
