WILLIAM & MARY
CENTER FOR GEOSPATIAL ANALYSIS

Overview of the William and Mary GIS Certificate Program

Draft Language as of 4/20/2018

The Post-Baccalaureate Certificate in Geospatial Information Systems (Science) provides students with a post-baccalaureate level academic credential in geospatial technologies. This program is designed for individuals who wish to enhance current knowledge and skills they may be using professionally; or want to pursue a fuller understanding of professional practice applying geospatial technologies to increase their competitiveness, or may not yet be ready to commit to a full graduate program.

The **Certificate can be completed in one year full time, but may be completed on a full-time or part-time basis**. *This certificate is not available to current William & Mary undergraduate students.* The post-baccalaureate Certificate in Geospatial Information Systems program requires a minimum of 15 credit hours of specified coursework. Individuals seeking admission into the GIS Certificate program must have completed a Bachelor's degree prior to their 1st semester enrolled as a Certificate program student. The Certificate program is administered through the Center for Geospatial Analysis, the intellectual nexus for geospatial education and research at William & Mary.

Students who wish to substitute a different 500+ level GIS course for one of those listed below should consult with the program coordinator, otherwise the course may not count towards the Certificate. No transfer credit is allowed for courses taken outside of William & Mary.

Students who have taken INTR204/GIS 201 as an undergraduate at W&M cannot transfer those hours into the Certificate but may be able to place out of the GIS 501 through a skills and knowledge demonstration and substitute another course to meet the credit hour requirement. Students in this situation should consult with the Certificate Coordinator.

The required courses for the GIS Certificate Program are as follows (all courses are 3 credit hours, unless otherwise noted) :

Fundamentals and Foundations of Geospatial Technology

- GIS 501: Fundamentals of Geographic Information Science and Analysis
- GIS 505: Geovisualization & Spatial Design Techniques
- GIS 501: Introduction to Remote Sensed Imagery and Analysis

Advanced Geospatial Topics/Discipline Uses of Geospatial Technology

- GIS 520: Advanced GIS Analysis and Programming
- GIS 580: Advanced Topics GIS Seminar
- GIS 550: Independent Research in GIS (1-3 credits variable)

Other Courses Offered at William and Mary

(These courses are currently not included in GIS Certificate program fee structure but *may* be available through specific departments as an NDS enrolling student where credit hour charges apply):

- GIS for Policy Analysis (PUBP 614)
- GIS for Biologists (BIOL 204)
- Legislative Redistricting with GIS (LAW 502)
- Discipline specific courses in William & Mary Departments to assist individuals in building understandings to apply to work with geospatial technologies

GIS Certificate Students are expected to:

- Enroll in at least 1 course per regular semester
- Earn a minimum of 15 credit hours of required coursework
- Meet minimum grade requirements:

Cumulative Course Credits	Cumulative G.P.A.
1-6	2.50
7-12	2.75
13-18	3.00

DRAFT LANGUAGE: Admission and Fee Rates

Admission

The Post-Baccalaureate GIS Certificate Program has rolling admissions. The Center for Geospatial Analysis welcomes applications for admissions in the following semester with decision deadlines of October 1 for Spring course enrollment, April 1 for summer course enrollment, and July 1 for fall course enrollments You will be notified of the decision about one month after we have received your application.

Individuals who wish to apply to the program should submit the following materials to the Coordinator of the GIS Certificate Program:

- **Application**. A completed application to the Post-Baccalaureate GIS Certificate Program (fillable PDF with information from NDS application).
- **Transcripts.** Official transcripts from *all* colleges or universities you have attended, with date of actual or expected degree(s) clearly indicated.
- **Letter of Recommendation.** A letter of recommendation from an employer or professor. This letter should be sealed separately in an envelope with the signature of the recommender across the back seal. These may be sent directly to the GIS Certificate Program Coordinator at the address found in the application.
- **Personal Statement**. A personal statement, not more than two double-spaced pages, explaining your interest in/prior experience with GIS and other geospatial technologies and how this certificate program will meet your personal or professional goals.
- **Application Fee.** See application for address and fee amount.

This post-baccalaureate GIS certificate program charges students at a differential tuition rate based on non-degree seeking (NDS) status and enrollment in this program. This rate applies to all students who enroll in this certificate program, regardless of in-state or out-of-state status. The differential tuition will be used to fund continuing improvements in the departmental computational facilities used to support the certificate program. The cost of the program will be based on number of certificate courses taken per semester and is calculated as a fee. Other courses at William and Mary outside of the certificate requirements will be charged at the normal NDS rate per credit hour and are subject to availability. See NDS policies found at:
https://www.wm.edu/offices/registrar/studentsandalumni/nds/postbacc/index.php

There are a number of William & Mary services available for students enrolling in the GIS Certificate program:

- Swem Library
- Dean of Students Office
- Disability Services
- Campus Parking (requires a purchase of permit)
- Writing Resource Center
- Cohen Career Center
- Counseling Center and Student Health Center (SUMMER ONLY - *NDS students enrolled in summer courses are now eligible to be seen at both the Counseling Center and the Student Health Center (not applicable fall and spring).*

Unfortunately, there are things not provided in your Certificate Program fees if you are not a full time student (paying full tuition and fees) this includes:

- Free admission to Athletic Events, you are welcome to attend but there will be a minimal cost
- Student Recreation Center & Facilities, Certificate students can purchase a membership for regular access
- University Sponsored Events, many events are open to the public or may be available at a minimal cost and others will not be available to NDS students.
- Student Clubs and Organizations
- Financial Aid is not available for GIS Certificate Program students.
- If you enroll for more than 12 credit hours in a semester, You will be charged ALL general and facility fees, and you will have access to ALL of the services listed above.

Vision for W&M GIS Certificate Program:

The William and Mary GIS Certificate Program will be Viable, Valuable and Visible.

The W&M GIS Certificate develops critical thinking and:

Geographic frameworks for inquiry
Exploring different pathways of knowledge and understanding
Opportunities for real world experience
Supporting decision making with data [analytics]
Programming approaches to geospatial technology
Applying spatial tools, applications, and geoprocessing
Transformative location-based technology solutions
Imagery exploration and analysis
Analytical problem solving and spatial thinking
Leveraging visualization and communication techniques across representational domains

GIS Certificate Curriculum Planning Document

Existing Course Number & Title	Title for New Certificate Program	Current Course Description	Changes for EPC/COG
INTR 201: INTR 204 - GIS In the Earth and Environmental Sciences (cross listed as ENSP 249)	Number and title change to GIS 201: Introduction to GIS and Spatial Analysis 3 Credit Hrs	This course will provide an introduction to using Geographic Information Systems (GIS) as a tool in earth and environmental science and policy. Emphasis will be on hands-on application of GIS to create maps, to organize and visualize spatial data, and to query spatial data to elucidate answers to earth and environmental questions	**EPC PROPOSAL:** **Title Change** **Course number change to GIS 201** **Description change (more interdisciplinary focused):** This course will provide an introduction to the fundamentals of geospatial technologies, including using Geographic Information Systems (GIS), Global Positioning Systems (GPS), basics of cartography, remote sensing and spatial analysis. Emphasis will be on hands-on application of these technologies to create maps, to organize and visualize spatial data, and to utilize spatial data to analyze and address social and environmental issues.
GIS 501 Fundamentals of GIS	GIS 501: Fundamentals of Geographic Information Science and Analysis 3 Credit Hrs	Fundamentals of GIS combines spatial data, often alongside tabular data, to map, analyze, and offer answers to questions posed in many differing disciplines. At William and Mary, GIS is used to model nutrient inputs from agriculture into the Chesapeake Bay, evaluate the role of school boundaries in determining neighborhood demographics, analyze international aid flows, create species distribution models, assess the the role of fire in agriculture, monitor social discord in Africa, asses local health outcomes, and measure the extent of coastal deforestation in South America. The GIS fundamentals course will use GIS-based research projects to introduce the fundamentals of vector data, raster data, database	**COG Repropose whole course GIS 501(last offered 2014)** **Title & Description change (no number change)** This course will provide an introduction to the fundamentals of geospatial technologies, including using Geographic Information Systems (GIS), Global Positioning Systems (GPS), basics of cartography, remote sensing and spatial analysis. This course emphasizes problem-solving and decision making using analysis techniques, applicable in a range of disciplines and interpretation and understanding of geospatial data formats used across professions. Coursework will focus on hands-on application of these technologies to create maps, to organize and visualize spatial

		operations, and interpolative techniques within a GIS environment.	data, and to utilize spatial data to analyze and address social and environmental issues. *COG PROPOSAL AS PART OF CERTIFICATE PROGRAM OFFERINGS BUNDLE*
	Propose: GIS 405/505 Geovisualization & Spatial Design Techniques 3 Credit Hrs	New Course	**EPC/COG NEW COURSE PROPOSAL** **Description:**Communicating geographic concepts, problems and solutions are key to the geovisualization and spatial design, the modern art and science of cartography. The foundational principles of the course will be grounded in the fundamentals of traditional cartography using GIS in combination with design and analytical software. This course will immerse students in color theory, symbology, typography, along with 2-D and 3-D design layout within web and print media. Hands-on learning experiences will emphasize and apply scientific visualization techniques alongside the art of data visualization, both in terms of how to use visualization to understand spatial data and to create strong visual communication.
Currently a topics course: INTR 490 - Introduction Remote Sensing Technologies Past Course: 510 Geospatial Pattern Analysis	Propose: GIS 410/510 Introduction to Remote Sensed Imagery and Analysis 3 Credit Hrs	**Description for Fall 2018 Course as an INTR 490:** Remote sensing is the art and science of obtaining information about an object without being in direct physical contact. Students will develop a robust understanding of the tools and techniques used to display, process, and analyze remotely sensed data, while studying the theory, principles, and methodology of remote sensing of the environment for geospatial application. Emphasis will be placed on designing, implementing, and critically evaluating the processes of image acquisition and data collection in the electromagnetic spectrum from a variety of sensors (i.e. aerial, satellite, multispectral, hyperspectral, and LiDAR) and analysis through data set manipulations. Upon completion of this course students will be able to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. **Description for 510 (2014)**	**EPC PROPOSAL** **Title Change** **Course number change to GIS 410** **Description:** Remote sensing is the art and science of obtaining information about an object without being in direct physical contact. Students will develop a robust understanding of the tools and techniques used to display, process, and analyze remotely sensed data, while studying the theory, principles, and methodology of remote sensing of the environment for geospatial application. Emphasis will be placed on designing, implementing, and critically evaluating the processes of image acquisition and data collection in the electromagnetic spectrum from a variety of sensors (i.e. aerial, satellite, multispectral, hyperspectral, and LiDAR) and analysis through data set manipulations. Upon completion of this course students will be able to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications.

		Spatial patterns, like the clustered results of an electoral outcome map, hot spots of disease infestation, or the uneven distribution of fresh produce venues in a city, are the outcome of important social and environmental processes and give us clues about the causes, impacts and the potential actions that can help enhance or inhibit them. Geospatial technology, analytical methods and visual capabilities provide a crucial toolkit to identify, extract, measure, analyze, and interpret spatial patterns, as well as to communicate analytical results in compelling visual ways according to various medium and to diverse audiences. This course is designed to cover key spatial pattern analytical techniques, their interpretation and effective visual representation.	**COG Proposal - reproposal of course offering** **Title Change for GIS 510** **Description change:** Remote sensing is the art and science of obtaining information about an object without being in direct physical contact. Students will develop a robust understanding of the tools and techniques used to display, process, and analyze remotely sensed data, while studying the theory, principles, and methodology of remote sensing of the environment for geospatial application. Emphasis will be placed on designing, implementing, and critically evaluating the processes of image acquisition and data collection in the electromagnetic spectrum from a variety of sensors (i.e. aerial, satellite, multispectral, hyperspectral, and LiDAR) and analysis through data set manipulations. Upon completion of this course students will be able to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. **EPC/COG PROPOSAL**
	Propose GIS 420/520: Advanced GIS Analysis and Programming 3 Credit Hrs	New course	**EPC/COG PROPOSAL - NEW COURSE** This course extends the existing base of GIS knowledge and skills by amplifying programmatic approaches to spatial data and analysis. Lectures, labs, and projects emphasize GIS model development, develop spatial database architecture and design best practices, and extend knowledge of web GIS by authoring and consuming geographic web services. Students will become familiar with methods of leveraging programming languages (such as Python) to make GIS processing easier, faster, and more accurate by scripting and automating data management, production, manipulation, and analysis procedures.
GIS 550 Independent Research in GIS (2014)	Propose: GIS 499/550 Independent Research in GIS 1-3 Credit Hrs	This course is designed to permit students to engage in applied GIS research projects with mentorship from their instructor. Working closely with a mentor each student will be expected to conduct original research and to prepare a substantial research report. It is expected that the project can be conducted in the context of the student's current employment or place of work, and the project can be spread over multiple semesters	**EPC - NEW COURSE GIS 410** **COG - Reproposal of old course with changes** **Title Change and new description for GIS 550** **Description:** Remote sensing is the art and science of obtaining information about an object without being in direct physical contact. Students will develop a robust understanding of the tools and techniques used to display, process, and analyze remotely sensed data, while studying the theory, principles, and

		if necessary. The course can be repeated for credit up to a maximum of 3 credits of GIS 550.	methodology of remote sensing of the environment for geospatial application. Emphasis will be placed on designing, implementing, and critically evaluating the processes of image acquisition and data collection in the electromagnetic spectrum from a variety of sensors (i.e. aerial, satellite, multispectral, hyperspectral, and LiDAR) and analysis through data set manipulations. Upon completion of this course students will be able to develop analytical workflows to derive products and extract information from remotely sensed data for a broad range of applications. This course provides students the opportunity to create a culminating project demonstrating their application of knowledge they have learned in geospatial technologies such as GIS, Remote Sensing, GPS, and spatial analysis. Students will design and apply practical research methodology for a geospatial project. This should include complex data collection/management and geospatial analysis techniques to a project or study based on their research interests or collaboration with a community/business partner. Identification of a faculty mentor is required. The course can be repeated for credit up to a maximum of 3 credits of GIS 550.
INTR 490 Advanced Topics GIS Seminar	Remain as advanced topics for flexibility GIS 490/580 1-3 Credit Hrs	Descriptions Vary GIS 490 Advanced Topics GIS Seminar (offered Spring 2018 as 3 Credit Hours) Currently no description in Curriculog	Varies based on topic **Only change at undergraduate level is a course number: GIS 490 available for special topics courses** **Need equivalent special topics numbers at 500 level when offered. Propose GIS 580** (Biology uses 680 for special topics)
INTR 490/LAW 502	1 Credit Hour	**Legislative Redistricting with Geographic Information Systems** **(Offered Fall 2017, Fall 2018)** With the 2020 Census on the near horizon, significant attention will be placed on redistricting in the coming years. Inherent in any redistricting plan is a recognition of the spatial configuration of voting districts and the processes driving proposed voting district maps. Federal and state constitutions and statues impose legal requirements for voting districts that in practice are often manipulated to	*Will need to go before EPC if becomes a more permanent course offering. Currently a CGA partnership course with the W&M School of Law*

		favor drawing lines that protect partisan/incumbent interests. This one credit course will combine an introduction to Geographic Information Systems (GIS) with a focus on the legal analysis of redistricting plans. Students will learn basic GIS skills and tools designed to develop compliant maps. This will include working with district boundary maps, census information and other socioeconomic layers in an integrated GIS platform to understand and quantify the impacts realized when voting districts are redrawn. The course will focus on the 2017 Supreme Court case Bethune-Hill v. Virginia State Board of Elections decision as a frame to better understand the laws governing redistricting efforts. After learning the legal parameters of the redistricting process, students will work in teams to develop and present a redistricting plan for the 12 state legislative districts identified as problematic in Bethune-Hill. In the process of coming up with ways to improve compliance with state and federal statutory and constitutional mandates, this course will uniquely prepare students to play a substantive part in the 2020 round.	
INTR490	3 Credit Hours	GIS 490/580 Geospatial Intelligence	*Proposed to be offered in Fall 2019 and then*