GEOGRAPHIC INFORMATION SYSTEMS, POST-BACCALAUREATE CERTIFICATE

Program Description

The Post-Baccalaureate Certificate in Geographic Information Systems (GIS) is designed for students who hold a bachelor's degree or master's degree in fields other than GIS and desire to continue their education in Geographic Information Systems. Candidates for the certificate are required to complete 32 or 33 credit hours of GIS-related courses; 20 of these credit hours must be taken at Texas A&M University-Corpus Christi. Students are required to meet all other academic standards. The Coordinator of the Geographic Information Science program or a designee may waive certain courses if a student has previously completed appropriate GIS courses. Students must apply for the certificate and complete a Certificate Plan approved by the Coordinator of the Geographic Information science program or a designee.

Student Learning Outcomes

The primary goal of the post-baccalaureate certificate in Geographic Information Systems is to educate students in GIS, providing opportunities to analyze data, explore issues, solve problems, and evaluate situations in a geographic and spatial context. Students will be able to:

1. Use GIS proficiently to conduct spatial analyses and build maps that are fit-for-purpose and effectively convey the information.
2. Use GIS analyses to address applied problems and/or research questions.
3. Demonstrate programming skills in GIS applications (i.e., Web GIS, and use scripting languages such as Python, etc.).

For Additional Information

Website: http://gisc.tamucc.edu/

Mailing Address:
Geographic Information Science Program, Unit 5797
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, Texas 78412-5797

Program Requirements

Code	Title	Hours
Required Courses		
GISC 1336	Digital Drafting and Design	3
GISC 1470	Geospatial Systems I	4
GISC 2301	Geospatial Systems II	3
GISC 2438	Web Map Development	4
GISC 3300	Geospatial Mathematical Techniques [1]	3
GISC 3420	GIS Programming and Software Development	4
GISC 3421	Visualization for GIS	4
GISC 4431	Remote Sensing and Photogrammetry [1]	4
Select one of the following:		3-4
COSC 1330	Programming for Scientists, Engineers, and Mathematicians	
COSC 1435	Introduction to Problem Solving with Computers I	
Total Hours		**32-33**

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It is assumed that the student has completed all prerequisites and corequisites for the required courses.

Note:

Students must earn at least a 2.5 overall grade point average in all GISC courses.

Course Sequencing

Certificate Coordinator: Dr. Hongzhi Song

Students should take the courses in the following sequence to complete in the most timely manner:

First Year		
Fall		**Hours**
GISC 1470	Geospatial Systems I	4
COSC 1330 or COSC 1435	Programming for Scientists, Engineers, and Mathematicians or Introduction to Problem Solving with Computers I	3-4
GISC 3300	Geospatial Mathematical Techniques	3
	Hours	**10-11**
Spring		
GISC 1336	Digital Drafting and Design	3
GISC 2301	Geospatial Systems II	3
GISC 3420	GIS Programming and Software Development	4
	Hours	**10**
Second Year		
Fall		
GISC 2438	Web Map Development	4
GISC 4431	Remote Sensing and Photogrammetry	4
	Hours	**8**
Spring		
GISC 3421	Visualization for GIS	4
	Hours	**4**
	Total Hours	**32-33**

Courses

GISC 1301 Physical Geography
3 Semester Credit Hours (3 Lecture Hours)
The goal of this course is to encourage you to think geographically, examining the interactions between physical systems and human activities. Introduction to topics covered include elements of Physical Geography (studies of atmosphere, ocean and land surface environments), Geographic Information Systems (computer systems that capture, analysis, and display of geographic information), and human environmental interactions. Cross listed with GEOG 1301.
TCCNS: GEOG 1301

GISC 1336 Digital Drafting and Design
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
An introduction to graphic and drafting principles and practices in surveying and mapping science. This course includes the development of the basic drafting skills needed to produce surveying plats and graphical presentations. The elements of descriptive geometry are addressed. A major component of the course is an introduction to the fundamentals of computer-aided drafting and design (CADD). Spring.

GISC 1470 Geospatial Systems I
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Introduction to geographic information systems (GIS) and its theoretical foundations. Topics covered include vector and raster data models, acquisition and manipulation of data, cartography, current topics, data quality, and basic spatial analysis. Principles and uses of GIS software also covered. Fall and Spring.

GISC 2250 Field Camp I
2 Semester Credit Hours (6 Lab Hours)
A one-week field camp with intensive field data collection and computations. Traversing between control points. Digital contour data and leveling control. Detail spatial data by total station. Construction set out using total station and steel band. Taken during the sophomore or junior year. Spring.
Prerequisite: GISC 2470.

GISC 2301 Geospatial Systems II
3 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
An intermediate level course in the concepts and applications of geographic information systems (GIS). Topics covered include spatial database design and management, raster analysis, terrain mapping, analysis, and applications. Spring.
Prerequisite: (GISC 1470).

GISC 2438 Web Map Development
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
Introduction to the design and development of GIS software to solve spatial problems. Topics covered include programming basics, with design and implementation of common tasks in GIS applications. Fall.
Prerequisite: GISC 1470 and COSC 1435 or COSC 1330.

GISC 2470 Geospatial Plane Measurement I
4 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Historical introduction to field measurement and mapping; distance measurement using electronic distance meters; calibration and reduction. Leveling instruments; principles, construction, testing and adjustment; ancillary equipment. Optical and electronic theodolites. Traverse computations and adjustment. Coordinate systems. Map projections. Fall.
Prerequisite: MATH 1316 or 2413.

GISC 3300 Geospatial Mathematical Techniques
3 Semester Credit Hours (3 Lecture Hours)
Characteristics of geographic/spatial information; overview of relevant sections of numbers, algebra and geometry, plane and spherical trigonometry, matrices, determinants and vectors, curves and surfaces, integral and differential calculus, partial derivatives, with an emphasis on geospatial applications. Concepts of geospatial coordinate systems and geospatial coordinate transformations; overview of spatial statistics and best-fit solutions with geospatial applications.
Prerequisite: MATH 2413 and 3342.

GISC 3325 Geodetic Science
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
History of geodetic measurement. Description of the geodetic model of the earth. Relationship between the ellipsoid, geoid, and earth's surface. Measurement of long baselines. Gravity and the geoid. Relationship between terrestrial observations and grid coordinates. Fall.
Prerequisite: GISC 2470.

GISC 3412 Geospatial Plane Measurement II
4 Semester Credit Hours (2 Lecture Hours, 3 Lab Hours)
Principles and reduction of observations and errors in spatial measurement. Techniques of horizontal and vertical angle measurement for precise positioning. Trigonometric heighting and vertical staff tacheometry. Setting out of structures. Design and computation of horizontal and vertical curves. Spring.
Prerequisite: (GISC 2470 and 1336*).
* May be taken concurrently.

GISC 3420 GIS Programming and Software Development
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
The course focuses on the design and implementation of GIS scripts and GIS applications. Topics covered included GIS programming (i.e. automate GIS tasks using scripting language), GIS tool creation, and advanced user interface design and implementation. This course dedicates time to programming fundamentals so that the skills learned can be applied to languages other than Python.
Prerequisite: GISC 2301 and (COSC 1435 or 1330).

GISC 3421 Visualization for GIS
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Basic elements of thematic cartography, cartographic theory, and cartographic projections. Integration of cartographic principles with GIS visualization. Principles of map design with GIS data. Spring.
Prerequisite: GISC 2301.

GISC 4180 Geospatial Systems Internship
1 Semester Credit Hour (1 Lecture Hour)
Internship education requires work with approved Geospatial Systems related industry employer. Students provide weekly written reports and final presentation to program at the end of internship. Must have completed 60 semester hours before attempting. Fall, Spring, and Summer.

GISC 4305 Legal Aspects of Spatial Information
3 Semester Credit Hours (3 Lecture Hours)
Legal ownership of spatial data and information collected in the public sector. Public access to large digital databases. Copyright law as applied to spatial data. Legal issues related to property boundaries, statutory boundaries, voter district boundaries, and jurisdictional boundaries. Government fees and charges for access to spatial data. Social and economic value of spatial data. Spring.
Prerequisite: GISC 2470.

GISC 4315 Satellite Positioning
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Global reference systems. Use of satellite for navigation and positioning systems. History and review of satellite positioning systems. Measurement techniques using GPS. Point, differential, and kinetic positioning techniques. Error sources in satellite positioning. Future trends in satellite positioning technology. Fall.
Prerequisite: GISC 2470 and MATH 2413.

GISC 4318 Cadastral Systems
3 Semester Credit Hours (3 Lecture Hours)
Land ownership recording systems used in Texas and U.S. Investigation and research for artificial and natural boundaries. Title searches at the county courthouse, title plants, and other sources for cadastral research. Riparian and littoral boundaries. Boundary marking and preparation of cadastral plans. Metes and bounds descriptions. Writing field notes. Urban and rural cadastral issues. Use of coordinate systems in cadastral mapping. Fall.
Prerequisite: GISC 3412.

GISC 4320 Hydrography
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Introduction to offshore and inshore hydrographic mapping. Tidal datums and their computation. Review of hydrographic and nautical charts. Electronic position finding and bathymetric data collection. Echo sounding, side scan sonar. Seafloor mapping and underwater locating. Beach (combined land and hydrographic) mapping. Spring even years.
Prerequisite: GISC 2470 and MATH 2413.

GISC 4335 Geospatial Systems III
3 Semester Credit Hours (2 Lecture Hours, 2 Lab Hours)
Advanced spatial analysis and modeling in GIS. Topics covered include exploratory analysis of spatial data, network analysis, spatial point patterns, area objects and spatial autocorrelation, and spatial interpolation. Also covers new approaches to spatial analysis. Fall.
Prerequisite: GISC 2301 and MATH 3342.

GISC 4340 Geospatial Computations and Adjustment
3 Semester Credit Hours (3 Lecture Hours)
Theory of least squares adjustment of spatial data. Use of matrices for the solution of equations. Propagation of variances and statistical testing of adjustment solutions. Error ellipses and confidence intervals. Spring.
Prerequisite: GISC 2470 and 3300.

GISC 4350 Field Camp II
3 Semester Credit Hours (6 Lab Hours)
A one-week field camp undertaking projects in cadastral, engineering, hydrographic, and geodetic positioning. Reduction of digital field data to produce final plans and reports. Taken during the senior year. Spring.
Prerequisite: GISC 3412, 4318 and 2250.

GISC 4351 Geospatial Systems Project
3 Semester Credit Hours
This course allows students to employ knowledge attained in other courses to create a project to spatially analyze information of interest to you and your field of study. Students will either undertake a GIS project to manage, analyze, and visualize spatial data, or a survey project in cadastral, topographic, engineering, hydrographic, or geodetic positioning survey. Spring. Students who enroll in the project course will need permission from the instructor.
Prerequisite: GISC 4350 or (GISC 3421 and 4335).

GISC 4371 History of Land Ownership
3 Semester Credit Hours (3 Lecture Hours)
This course prepares students by providing proper knowledge of how land transferred throughout history and techniques for researching land ownership in the present. Students receive an overview of legal aspects and other topics relative to land issues applicable for Land Surveyors, Civil Engineers, and GIS professionals, among others. Spring.
Prerequisite: GISC 3412.

GISC 4431 Remote Sensing and Photogrammetry
4 Semester Credit Hours (3 Lecture Hours, 3 Lab Hours)
Provides the foundations to interpret, process, and apply remotely sensed data acquired by satellites and sub-orbital platforms (aircraft, UAVs) for mapping and analysis of our natural and built environment. Principles of electromagnetic energy-matter interaction, remote sensing systems and data characteristics, digital image processing, and informaton extraction methods will be covered. Included is treatment of: aerial photogrammetry; multispectral, thermal, and hyperspectral sensing; earth observation satellites; radar and lidar; emergent topics. Emphasis will be on their use for geospatial and environmental applications. Fall.
Prerequisite: (PHYS 2425 and GISC 3300) or (MEEN 3310 and PHYS 2425).

GISC 4590 Selected Topics
1-5 Semester Credit Hours (1-5 Lecture Hours)
May be repeated for credit depending on topic. Variable content.

GISC 4596 Directed Independent Study
1-5 Semester Credit Hours
See College description. Offered on request. May be repeated for credit.

GISC 4690 Co-operative Education
1 Semester Credit Hour (1 Lecture Hour)
Co-op education allows students to take time off their full-time studies to gain valuable experience-based learning with employers willing to put on students for a semester (14 weeks), six months, or over the summer. The Co-op program allows students to maintain their full-time status as a student (continue health insurance coverage with parents, not effect student loan repayment, access to college activities, etc.) while undertaking work in their field of interest. The Co-op program is a partnership between the employer, the student, and the university.