GEOGRAPHIC INFORMATION SCIENCE, BS

Program Description

The Geographic Information Science Program prepares graduates with knowledge and skills for a variety of career paths related to the acquisition, analysis, and management of geospatial data and information. Career paths include pursuing advanced degrees and employment in the fields of Geomatics and Geospatial Information Systems.

Program Objectives

- Geographic Information Science program graduates will demonstrate growth and advancement in the surveying profession or geospatial sciences.
- Students will be capable of continuing paths towards graduate studies and/or employment in the fields of Geomatics and Geographic Information Systems.
- Students will be prepared to become Registered Professional Land Surveyors and/or GIS Professionals.

Student Learning Outcomes

Graduates of the program will have:

1. An ability to identify, formulate, and solve broadly-defined technical or scientific problems by applying knowledge of mathematics and science and/or technical topics to areas relevant to the discipline.
2. An ability to formulate or design a system, process, procedure or program to meet desired needs.
3. An ability to develop and conduct experiments or test hypotheses, analyze and interpret data and use scientific judgment to draw conclusions.
4. An ability to communicate effectively with a range of audiences.
5. An ability to understand ethical and professional responsibilities and the impact of technical and/or scientific solutions in global, economic, environmental, and societal contexts.
6. An ability to function effectively on teams that establish goals, plan tasks, meet deadlines, and analyze risk and uncertainty.

Program

The Geographic Information Science Program provides broad-based expertise and cutting-edge skills that span the growing geospatial field and helps to alleviate the shortage of well-educated geospatial professionals. The program is intended for those seeking to become surveyors, engineers and other geospatial professionals with knowledge and skills in using and managing rapidly developing geospatial technologies.

Our GIS and Geomatics curriculum covers a wide range of geospatial principles. Students engage in activities using a systematic approach to integrate all means of capturing and managing spatial data required for scientific, administrative, legal, and technical operations involved in the production and management of spatial information. These activities include, but are not limited to, cartography, control surveying, digital mapping, geodesy, geographic information systems, hydrography, land information management, land surveying, mining surveying, photogrammetry, and remote sensing.

The curriculum also focuses on computer-based solutions to problems involving the collection, synthesis, analysis, and communication of spatially related information within a geographic jurisdiction or area. It meets the needs of local, state, and federal government agencies and private industries' transitioning to highly automated graphics systems that integrate digital mapping with computerized databases.

The program prepares graduates for careers in industry and/or science. Students are required to complete a Capstone Project related to one of the above areas of interest. The Capstone Project will be evaluated under the Geospatial Systems Project GISC 4351 Geospatial Systems Project (3 sch) course. Students who complete the program have a comprehensive understanding of these disciplines that empowers them to advance their careers in geospatial technologies or to continue their studies to further advance the science.

For Additional Information

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

Mailing Address:
Geographic Information Science Program, Unit 5868
College of Science and Engineering
Texas A&M University-Corpus Christi
6300 Ocean Drive
Corpus Christi, TX 78412-5868

General Requirements

Requirements	Credit Hours
First-Year Seminars (when applicable)[1]	0-2
Core Curriculum Program (http://catalog.tamucc.edu/undergraduate/university-college/programs/core-curriculum-program/)	42
Foundations Required for the Geographic Information Science Program	8
Core Required for the Geographic Information Science Program	73
Designated Electives	3
Total Credit Hours	**126-128**

[1] Full-time, first time in college students are required to take the first-year seminars.
- UNIV 1101 First-Year Seminar I (1 sch)
- UNIV 1102 First-Year Seminar II (1 sch)

Degree Requirements

Code	Title	Hours
Full-time, First-year Students		
UNIV 1101	First-Year Seminar I *	1
UNIV 1102	First-Year Seminar II *	1

Core Curriculum Program		
University Core Curriculum		42
Students must take:		
MATH 2413	Calculus I	
MATH 2414	Calculus II (Lecture Component/3 hours)	
PHYS 2425	University Physics I	
PHYS 2426	University Physics II	
Foundations Required for the Geographic Information Science		
MATH 2414	Calculus II (included in University Core)	1
MATH 3342	Applied Probability and Statistics *,^	3
COSC 1435	Introduction to Problem Solving with Computers I	4
or COSC 1330	Programming for Scientists, Engineers, and Mathematicians	
Core Required for the Geographic Information Science Program		
GISC 1336	Digital Drafting and Design	3
GISC 1470	Geospatial Systems I	4
GISC 2250	Field Camp I	2
GISC 2301	Geospatial Systems II	3
GISC 2438	Geospatial Software Systems I	4
GISC 2470	Geospatial Plane Measurement I	4
GISC 3300	Geospatial Mathematical Techniques	3
GISC 3325	Geodetic Science	3
GISC 3412	Geospatial Plane Measurement II	4
GISC 3420	Geospatial Software Systems II	4
GISC 3421	Visualization for GIS	4
GISC 4180	Geospatial Systems Internship ^	1
GISC 4305	Legal Aspects of Spatial Information	3
GISC 4315	Satellite Positioning	3
GISC 4318	Cadastral Systems	3
GISC 4335	Geospatial Systems III	3
GISC 4340	Geospatial Computations and Adjustment	3
GISC 4350	Field Camp II	3
GISC 4351	Geospatial Systems Project	3
GISC 4371	History of Land Ownership	3
GISC 4431	Remote Sensing	4
6 hours of mathematics and/or sciences [1]		6
MATH 2305	Discrete Mathematics I	
MATH 2415	Calculus III	
MATH 3311	Linear Algebra	
One 3 hour upper-division MATH elective		
Designated Electives		
Select one of the following:		3
GISC 4320	Hydrography	
GISC 4590	Selected Topics (Approved by GIS faculty)	
Total Hours		**128**

[1] Math can be any division math courses. Note: The course(s) satisfies a Mathematics Minor is a good choice.
Science can be any Natural Science course (based on scientific method) above 2000, or any Natural Science course that satisfies the laboratory science group (cannot satisfy both).
Sciences are disciplines focused on knowledge or understanding of the fundamental aspects of natural phenomena. Sciences course(s) consist of chemistry and physics besides the degree required core and other natural sciences including life, Earth, and space sciences.

* Online offering

^ Blended offering

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 Geospatial Software Systems I
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, DESIGN AND IMPLEMENTATION 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 Geospatial Software Systems II
4 Semester Credit Hours (3 Lecture Hours, 2 Lab Hours)
ADVANCED PROGRAMMING COURSE FOCUSING ON THE DESIGN AND IMPLEMENTATION OF GIS SCRIPTS AND GIS WEB APPLICATIONS. TOPICS COVERED INCLUDE GIS WEB APPLICATIONS, WEB MASHUPS, GIS SCRIPTS, GIS TOOL CREATION, AND ADVANCED USER INTERFACE DESIGN AND IMPLEMENTATION. SPRING.
Prerequisite: GISC 2438.

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 2470.

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 4326 Geomatics Professional Practice
3 Semester Credit Hours (3 Lecture Hours)
AN INTENSIVE ONE-WEEK SUMMER COURSE PRESENTED BY PRACTICING GEOMATICS PROFESSIONALS COVERING MANY OF THE ASPECTS OF OPERATING A PROFESSIONAL SURVEYING PRACTICE IN THE STATE OF TEXAS. TOPICS COVER SURVEYOR RESPONSIBILITY AND LIABILITY, THE SURVEYOR IN COURT, STANDARDS OF PRACTICE, SURVEYING MATHEMATICS, TEXAS COORDINATE SYSTEM, CELESTIAL OBSERVATIONS, AND PROJECT CONTROL.
Prerequisite: GISC 2250.

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, 3421 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, MATH 3342 and GISC 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.
Prerequisite: GISC 4350 or 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
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, MATH 3342 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.