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

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<th>Requirements</th>
<th>Credit Hours</th>
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<td>First-Year Seminars (when applicable)</td>
<td>0-2</td>
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<td>Core Curriculum Program</td>
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<td>Foundations Required for the Geographic Information Science Program</td>
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<td>Core Required for the Geographic Information Science Program</td>
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<td>Designated Electives</td>
<td>3</td>
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<td>Total Credit Hours</td>
<td>126-128</td>
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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

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<tr>
<th>Code</th>
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<th>Hours</th>
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<tr>
<td>UNIV 1101</td>
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<tr>
<td>UNIV 1102</td>
<td>First-Year Seminar II *</td>
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# Core Curriculum Program

**University Core Curriculum**

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)  
- MATH 3342  Applied Probability and Statistics  
- COSC 1435  Introduction to Problem Solving with Computers I  
  or COSC 1330  Programming for Scientists, Engineers, and Mathematicians

### Core Required for the Geographic Information Science Program

- GISC 1336  Digital Drafting and Design  
- GISC 1470  Geospatial Systems I  
- GISC 2250  Field Camp I  
- GISC 2301  Geospatial Systems II  
- GISC 2438  Geospatial Software Systems I  
- GISC 2470  Geospatial Plane Measurement I  
- GISC 3300  Geospatial Mathematical Techniques  
- GISC 3325  Geodetic Science  
- GISC 3412  Geospatial Plane Measurement II  
- GISC 3420  Geospatial Software Systems II  
- GISC 3421  Visualization for GIS  
- GISC 4180  Geospatial Systems Internship  
- GISC 4305  Legal Aspects of Spatial Information  
- GISC 4315  Satellite Positioning  
- GISC 4318  Cadastral Systems  
- GISC 4335  Geospatial Systems III  
- GISC 4340  Geospatial Computations and Adjustment  
- GISC 4350  Field Camp II  
- GISC 4351  Geospatial Systems Project  
- GISC 4371  History of Land Ownership  
- GISC 4431  Remote Sensing  
- 6 hours of mathematics and/or sciences  
- 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:

- GISC 4320  Hydrography  
- GISC 4590  Selected Topics (Approved by GIS faculty)

## 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.

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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
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.
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 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 SOUNGING, 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 information 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.