# **GEOGRAPHIC INFORMATION** SCIENCE (GISC)

## 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 (CAD) and design.

#### 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 2301 Geospatial Systems II

#### 3 Semester Credit Hours (3 Lecture 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 2338 Web Map Development

## 3 Semester Credit Hours (3 Lecture 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. **Prerequisite:** GISC 1470 and (COSC 1435 or 1330).

## GISC 2350 Field Camp

#### **3 Semester Credit 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. **Prerequisite:** GISC 2470.

## 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. MATH 1316 or placement in a course beyond or at a higher level than MATH 1316.

Prerequisite: MATH 1316 and GISC 1336<sup>\*</sup>.

May be taken concurrently.

## 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 3320 GIS Programming and Software Development 3 Semester Credit Hours (3 Lecture 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 3325 Geodetic Science

#### 3 Semester Credit Hours (3 Lecture 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. **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. **Prerequisite:** GISC 2470.

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)

This course provides students with a comprehensive overview of the legal considerations surrounding spatial information and land issues relevant to Land Surveyors, Civil Engineers, and GIS professionals, among others. Topics include the legal ownership of spatial data collected in the public sector, public access to extensive digital databases, and the application of copyright law to spatial data. Students will explore legal issues related to property boundaries, statutory boundaries, voter district boundaries, and jurisdictional boundaries. The course also covers government fees and charges for accessing spatial data, as well as the social and economic value of this information. **Prereguisite:** GISC 4318.

## **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)

This course provides a comprehensive overview of the historical evolution of land ownership and the development of cadastral systems. This includes land ownership recording systems used in Texas and throughout the U.S. Investigation and research for artificial and natural boundaries. Online resources for title searches, i.e., 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. Urban and rural cadastral issues. Use of coordinate systems in cadastral mapping. **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 4331 Remote Sensing and Photogrammetry 3 Semester Credit Hours (3 Lecture Hours)

Foundational topics include remote sensing systems, sensors, and electromagnetic energy propagation. Geomatics topics include airborne and analytical photogrammetry, structure-from-motion (SfM), dronebased mapping, lidar scanning, georeferencing, and data quality control. Additional topics include 3D point cloud data, multispectral image processing, thermal imaging, and geospatial AI. The course provides students with an understanding of the scientific and engineering principles of remote sensing while developing their skills in GIS and geomatics through practical techniques and use of the technology. **Prerequisite:** (PHYS 2425 and GISC 3300).

#### GISC 4335 Geospatial Systems III 3 Semester Credit Hours (3 Lecture 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. **Prerequisite:** GISC 2301 and MATH 3342.

#### GISC 4340 Geospatial Computations and Adjustment 3 Semester Credit Hours (3 Lecture Hours)

This course provides a comprehensive introduction of spatial information analysis and adjustment computations, drawing on methodologies and tools for achieving accuracy in geomatics and GIS. Students will learn concepts of error analysis and correction techniques, with a strong emphasis on least squares adjustment. **Prerequisite:** GISC 3412 and 3300.

## GISC 4350 Boundary Surveying and Professional Practice 3 Semester Credit Hours

This course provides a comprehensive overview of boundary surveying principles and professional practices. Focuses on the methodologies and techniques for processing and reducing digital field data to create final survey deliverables and reports. Students will explore the legal, ethical, and technical aspects of boundary surveying, including land ownership, property rights, and relevant regulations. This course emphasizes the transition from raw data collection to polished, professional outputs. **Prerequisite:** GISC 3412 and 4318.

## GISC 4351 Geospatial Science Project 3 Semester Credit Hours

This course allows students to apply a broad knowledge of geospatial science in designing and implementing comprehensive geospatial science projects. Students will select a topic relevant to their interests and develop a spatial analysis to address real-world challenges. Students will employ critical-thinking skills throughout the course to generate, evaluate, and implement geospatial solutions. Emphasis will be placed on problem-solving, data acquisition, data interpretation, and the integration of geospatial data into decision-making processes, preparing students for advanced research or professional applications in geospatial science. **Prerequisite:** GISC 3421<sup>\*</sup>, 4350<sup>\*</sup> and 4335.

May be taken concurrently.

# **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.