

Geospatial Surveying Engineering FOR THE 2010-2011 CATALOG

MASTER OF SCIENCE

Program Description

The Master of Science in Geospatial Surveying Engineering will provide students with knowledge and skills focusing on the research, design, development, and use of technologies in geospatial surveying engineering. The program builds upon the ABET accredited undergraduate Geographic Information Science program (GISCI). The program satisfies the regional, state and national need for master's-level graduates in geospatial systems design and surveying engineering. Due to the diversity of geospatial applications in industry, the 36 credit hour program is purposely designed to offer breadth in the course work.

The degree requires a minimum of 36 semester-credit hours. This must include 12 semester credit hours in the geospatial surveying engineering core, 12 semester credit hours in electives for Graduate Thesis option or 18 semester credit hours in electives for Graduate Creative Project option, a 3 semester credit hour graduate thesis proposal and 9 semester credit hours for graduate thesis (resulting in a completed thesis) or 3 semester credit hour graduate creative project proposal and 3 semester credit hours for graduate creative project (resulting in a formal project report).

Objectives of the program

Graduates of the Master of Science in Geospatial Surveying Engineering will demonstrate the ability to:

1. Develop, manage, analyze, and disseminate geospatial data using field and laboratory techniques, integrating surveying and engineering.
2. Develop the capacity for continued learning and professional application.
3. Apply geospatial surveying engineering technologies creatively in real-world settings to model geospatial processes and effects.
4. Become nationally and internationally recognized professionals.

Program Outcomes

Graduates of the Master of Science in Geospatial Surveying Engineering will have:

1. The ability to lead teams and apply problem-solving skills that include oral and written communication skills to effectively manage geospatial information.
2. An awareness and utilization of external organizations and institutions that provide useful geospatial data sets and their relationships to traditional and contemporary societal issues.
3. A recognition of the need for continued learning and development of leadership skills through involvement in volunteer professional organizations and societies.

Admission Requirements

Students seeking admission to the graduate degree program in Geospatial Surveying Engineering must hold a bachelor's degree from a regionally accredited institution of higher education in the United States (or an equivalent foreign institution). Each applicant must also submit the following to the Office of Graduate Studies and Research:

1. An application and application fee.
2. Transcripts from regionally accredited institutions (international students will be required to submit relevant international transcripts).
3. At least two reference letters, one each from industry and academic institutions.

4. Official GRE scores.

Students who have not completed all general prerequisites listed below may be conditionally admitted subject to their completion of all foundation or prerequisite courses with grades of “B” or better.

Degree Requirements

The course of study leading to a MS degree in Geospatial Surveying Engineering is composed of four components:

- I. General prerequisites (must be satisfied before the student can be formally and unconditionally accepted to the MS program).
- II. Options
- III. Required Courses.
- IV. Elective Courses.
- V. Additional Courses.

I. General Prerequisites

1. Geospatial Surveying Engineering

Every student is expected to have achieved certain minimum competencies in geospatial science before being formally admitted to the MS degree program. Students who have not earned a baccalaureate degree in Geographic Information Science, Surveying, or a similar field must consult with the coordinator of the Geospatial Surveying Engineering Program to design a plan of appropriate leveling courses. If leveling is required, entrance into the degree program will be conditional until leveling courses are completed or courses designated by the program coordinator are approved and completed. Such courses (4000-sequence or lower) are regarded as foundation or leveling work and do not count as credit towards the total required for completion of the graduate degree.

2. Mathematics

Every student must have minimum level of knowledge in mathematics equivalent to the mathematics courses in the BS in GIS and will be evaluated on an individual basis by Geospatial Surveying Engineering faculty.

3. English

Every student is expected to have minimum competencies in English composition, especially in technical writing. In preparation for reports that are required in the workplace, numerous reports are required during the course of study for the degree. In addition, the Graduate Proposal and Graduate Creative Report or Graduate Thesis is part of the program. Students may satisfy the writing requirement by completing one of the following courses:

ENGL 3301 Principles of Professional & Report Writing

ENGL 3379 Writing in Computer-Network Environment

ENGL 3380 Advanced Writing in Computer-Network Environment

- a. Such courses (4000-sequence or lower) are regarded as foundation or leveling work and do not count as credit towards the total required for completion of the graduate degree.
4. Students may be required to take an entrance exam before being allowed to register for classes.

II. Options

Students will choose between thesis and project options. The project option is a Graduate Creative Project designed for students who desire a greater breadth of understanding of geospatial surveying engineering than the thesis option provides. The curriculum will especially benefit individuals employed in scientific or technical fields who seek advancement or additional training to enhance their knowledge and skills. Graduate Creative Project students must complete a professional research project with a written final report and seminar. The thesis option requires a Graduate Thesis based upon original research, supported by the scientific literature, and proved statistically, when appropriate. The thesis option master's degree will allow a person to pursue advanced graduate study, or to obtain employment in most areas requiring a detailed knowledge of a specific aspect of geospatial surveying engineering. Students following either option will be required to take a core of interdisciplinary courses to provide a broad background, and to select elective courses in consultation with their advisory committee to provide in depth education in a particular area of emphasis related to geospatial surveying engineering. The elective courses may derive from one science discipline but they will often be interdisciplinary.

1. Thesis Option

The thesis option requires a Graduate Thesis based upon original research, supported by the scientific literature, and proved statistically, when appropriate. The thesis option master's degree will allow a person to pursue advanced graduate study, or to obtain employment in most areas requiring a detailed knowledge of a specific aspect of geospatial surveying engineering. The Geospatial Surveying Engineering Graduate Thesis requires 9 hours of research and a formal publishable thesis. When a student is within 15 semester hours of graduation, he/she may register for GSEN 5395 Graduate Project Research and Proposal to develop a proposal for graduate thesis. After the student has completed all other requirements for the MS degree in GSEN, he/she must schedule an oral exam over his/her graduate program of study and thesis.

Graduate Project Research and Proposal (GSEN 5395) and Graduate Thesis (GSEN 5998) (Total 12 hours)

Thesis Option	Sem. Hrs.
Required Core Courses	12
Elective Courses	12
Graduate Project Research and Proposal	3
Graduate Thesis	9
Total hours (Thesis option):	36

2. Project Option:

The project option is a Graduate Creative Project designed for students who desire a greater breadth of understanding of geospatial surveying engineering than the thesis option provides. The curriculum will especially benefit individuals employed in scientific or technical fields who seek advancement or additional training to enhance their knowledge and skills. Creative Project students must complete a professional research project with a written final report and seminar. The Geospatial Surveying Engineering Graduate Creative Project requires 3 hours of research

and a formal publishable project report. When a student is within 15 semester hours of graduation, he/she may register for GSEN 5395 Graduate Project Research and Proposal to develop a proposal for Graduate Creative Project. After the student has completed all other requirements for the MS degree in GSEN, he/she must schedule an oral exam over his/her graduate program of study and creative project.

Graduate Creative Project (GSEN 5993) and Graduate Project Research and Proposal (GSEN 5395) (Total 6 hours)

Project Option	Sem. Hrs.
Required Core Courses	12
Elective Courses	18
Graduate Project Research and Proposal	3
Graduate Creative Project	3
Total hours (Project option):	36

III Required Core Courses

All Geospatial Surveying Engineering students must complete 12 semester hours from the following courses:

Geospatial Surveying Engineering Core	Sem. Hrs.
GSEN 5381 Cadastral Information Systems	3
GSEN 5355 Design and Analysis of GIS Applications	3
GSEN 5365 Geospatial Multivariate Techniques	3
GSEN 5383 Designing Digital Surface Models	3

IV Elective Courses

Thesis option students must complete 12 semester hours and project option students must complete 18 semester hours from the courses listed below or from other interdisciplinary courses, as selected in consultation with their advisory committee, to provide a broad background in geospatial surveying engineering or related fields:

Geospatial Surveying Engineering Electives	Sem. Hrs.
GSEN 5382 Policy and Legal Aspects of Spatial Information Systems	3
GSEN 5384 Generalization of Topographic Maps	3
GSEN 5385 Analytical and Digital Photogrammetric Engineering	3
GSEN 5386 Problems in Remote Sensing of the Environment	3
GSEN 5387 Geospatial Intelligence Techniques	3
GSEN 5388 Geospatial Internet Data Tracking	3
GSEN 5390 Advanced Topics	3
GSEN 5396 Directed Independent Study	3

V. Additional Courses

The following additional courses may be offered and substituted for any of the courses mentioned in II subject to approval by the student graduate mentor or committee chair.

GSEN 5390 Advanced Topics

GSEN 5396 Directed Independent Study

Chronological Procedure Leading to the MS Degree

1. Completion of a degree plan

Upon admission to the MS degree program in Geospatial Surveying Engineering, and prior to enrollment in any course, *the student must contact the Graduate Academic Advisor in the College of Science and Technology to have a degree plan completed.* The student will then be assigned an academic advisor/mentor who is a graduate faculty member of the Geospatial Surveying Engineering program. Students must arrange to see this advisor/mentor each semester until graduation to have their semester course schedules approved.

2. Progress toward the degree

Once admitted to the graduate degree program in Geospatial Surveying Engineering, a student must complete at least six semester credit hours per year toward the degree until the degree is completed. Failure to make this minimum progress will result in dismissal from the degree program with possible readmission based on the catalog in effect at the time of re-admission. A student who is actively pursuing a graduate creative project or graduate thesis and has completed all other course work for the degree will be required to register for 3 credit hours continuously until the project is completed.

3. Graduate Thesis and Graduate Creative Project procedure

Following a consultation with and permission of the advisor/mentor, the student may register for GSEN 5395 to develop a proposal for the graduate thesis or graduate creative project. After the proposal is approved by the thesis or creative project chairperson, the proposal must be submitted to the full thesis or creative project committee. This three-member committee shall consist of at least two full-time Texas A&M University-Corpus Christi graduate faculty members. The committee chairperson must be a graduate faculty member in the geospatial surveying engineering program. The second committee member may be a graduate faculty member in geospatial surveying engineering, geographic information science, or computer science. The third member may be a graduate faculty member having distinguished professional status and expertise in the discipline of the proposed graduate thesis.

After the approved graduate thesis or project proposal is placed in the student's file, the student may register for GSEN 5998 or GSEN 5993. Once a student has registered for Graduate Thesis or Graduate Creative Project, he or she must continue to register in each consecutive semester until the thesis or creative project is completed. A student who does not complete a thesis or creative project in the semester for which he or she has registered will receive a grade of IP (In Progress). Failure to register for an incomplete thesis or creative project in the next semester will terminate the thesis or creative project and will require that the entire thesis or creative project process be repeated starting with the submission of a new thesis or creative project proposal.

4. Final examination and thesis or project report

After completion of all other requirements for the MS degree in Geospatial Surveying Engineering, the student must schedule an oral exam over his/her graduate program of study. The oral exam may include any material from the program of study and will be administered by the graduate committee. It will focus heavily on the thesis or creative project.

The graduate thesis or graduate creative project (see GSEN 5998 or GSEN 5993) may be completed in one semester; however, with continuous registration, a student will be allowed up to one calendar year to complete the thesis or creative project. Any extension beyond one year will require written justification on a semester-to-semester basis, to be approved by each member of the committee and the coordinator of the Geospatial Surveying Engineering program.

For Additional Information

Website:	http://gisc.tamucc.edu
Campus Address:	Conrad Blucher Institute; Phone: 361-825-3712
Mailing Address:	Geospatial Surveying Engineering Program, Unit 5868 Texas A&M University-Corpus Christi 6300 Ocean Drive Corpus Christi, TX 78412-5868

GRADUATE COURSES

GSEN 5300. 3 sem. hrs. (3:0)

BASES OF GEOGRAPHIC INFORMATION SYSTEMS

Basic principles and concepts of GIS via fundamental geographic and cartographic concepts. Understanding and use of GIS software to analyze data and produce maps. May not apply for credit toward the GSEN-MS degree.

GSEN 5301. 3 sem. hrs. (3:0)

FOUNDATIONS OF GEOSPATIAL SURVEYING ENGINEERING

An introduction to geospatial science and technology, including coordinate systems, datums, the Global Positioning System and quality assurance and accuracy assessment of geospatial data. May not apply for credit toward the GSEN-MS degree.

GSEN 5355. 3 sem. hrs. (3:0)

DESIGN AND ANALYSIS OF GIS APPLICATIONS

An advanced course that concentrates on the design and analysis of the development of GIS software. Course will utilize “Active X” map objects within JAVA, VB, Delphi or C++. Covers basic operation in GIS software design and software engineering procedures for final product distribution. Development of final product with associated data distributions files for stand alone, imbedded and web enabled applications. Prerequisite: Permission of the Program Coordinator.

GSEN 5365. 3 sem. hrs. (3:0)

GEOSPATIAL MULTIVARIATE TECHNIQUES

Application of multivariate statistical procedures to research problems in GSEN, with emphasis on peculiarities of such applications. Spatial autocorrelation, areal aggregation, modifiable areal unit problem, spatial interpolation, and trend surfaces are investigated with statistical and GIS software packages. Prerequisite: Permission of the Program Coordinator.

GSEN 5381. 3 sem. hrs. (3:0)

CADASTRAL INFORMATION SYSTEMS

A review of the evolution of European cadastral systems and land records traditions and alternatives. Examination of the goals and purposes of land tenure systems with attention to social, political, legal, economic, organizational, and technical issues. Exploration of U.S. modernization efforts and the problems of developing countries. Prerequisite: Permission of the Program Coordinator.

GSEN 5382. 3 sem. hrs. (3:0)

POLICY AND LEGAL ASPECTS OF SPATIAL INFORMATION SYSTEMS

A study of the current and emerging status of computer law in electronic environments. Covers issues related to: privacy, freedom of information, confidentiality, copyright, and legal liability; the impact of statute and case law on use of digital databases and spatial databases; and research of legal options of conflicts related to spatial data. Prerequisite: Permission of the Program Coordinator.

GSEN 5383. 3 sem. hrs. (3:0)

DESIGNING DIGITAL SURFACE MODELS

This course will provide an in-depth examination of digital surface models (DSMs) with an

emphasis on digital terrain models (DTMs). The theory of DSMs will include data acquisition, type of surface or terrain, point distribution and density, interpolation procedures, data output, and applications of DSMs. Topics covered will include digital elevation models (DEMs), vertical datums, accuracy standards, enabling technologies, quality assessment and user requirements with an introduction to terrain analysis. Prerequisite: Permission of the Program Coordinator.

GSEN 5384. 3 sem hrs. (3:0)

GENERALIZATION OF TOPOGRAPHIC MAPS

This course will cover principles of advanced cartographic generalization including cartometric evaluation and spatial and attribute transformations. Topics include an overview of vector based and raster based generalization and the mathematical foundations of topographic map design and generalization. Prerequisite: Permission of the Program Coordinator and GSEN 5383.

GSEN 5385. 3 sem. hrs. (3:0)

ANALYTICAL AND DIGITAL PHOTOGRAMMETRIC ENGINEERING

A study of the mathematical and geometric models of modern photogrammetry. Covers principles of stereoscopic vision, collinearity, coplanarity, epipolar geometry, ground control densification and extension by analytical aerotriangulation. Explores automation in photogrammetric procedures - digital aerotriangulation, automated data capture. Prerequisite: Permission of the Program Coordinator and GSEN 5365.

GSEN 5386. 3 sem hrs. (3:0)

PROBLEMS IN REMOTE SENSING OF THE ENVIRONMENT

Advanced problems in photo interpretation, photogrammetry and remote sensing within a GIS. Topics include utilization of expert computer systems, knowledge based environmental modeling, macro languages and spatial modeling languages. Operations and laboratories will cover mathematical operations on raster layers, convolution filtering, neighborhood analysis, principal components, proximity, contiguity and descriptor table manipulation. Final project includes the development of a remote sensing of the environment software program with a graphical user interface. Prerequisite: Permission of the Program Coordinator.

GSEN 5387. 3 sem hrs. (3:0)

GEOSPATIAL INTELLIGENCE TECHNIQUES

Research into geospatial intelligence tools used to assist the NGA in addressing the Intelligence Community's needs. Topics will include change detection and motion determination for terrestrial and aerial images, intelligent image classification and categorization, and other advanced topics. Study of the sensors systems utilized in the GEOINT with multi-deployment and real-time reporting will be examined. Prerequisite: Permission of the Program Coordinator.

GSEN 5388. 3 sem hrs. (3:0)

GEOSPATIAL INTERNET DATA TRACKING

Projects will be developed that work on investigation of GEOINT being shared, scoped, or provided through the internet. Data acquisition via "Honey Pots", IP HiJacks, Spoofs, and other method will be investigated. A method to take future GPS positioned terrestrial images into GEOINT areas on the web will be investigated. Prerequisite: Permission of the Program Coordinator.

GSEN 5390. 3 sem. hrs. (3:0)

ADVANCED TOPICS

Variable content study of specific areas of geospatial surveying engineering. May be repeated for credit when topics vary. Offered on sufficient demand. Prerequisite: Permission of the Program Coordinator.

GSEN 5395. 3 sem. hrs. (3:0)

GRADUATE PROJECT RESEARCH AND PROPOSAL

Preparatory and developmental research for the graduate thesis or creative project resulting in the preliminary design and formal proposal of the graduate project. This thesis or a creative project proposal must be reviewed and approved by the project chairperson to receive credit. Offered on a credit/no-credit basis only. Students are required to complete a major field assessment test. Credit will not be recorded until the Graduate Project Proposal is approved by the Graduate Project Committee Chair. Prerequisite: Permission of the Program Coordinator.

GSEN 5396. 3 sem. hrs. (3:0)

DIRECTED INDEPENDENT STUDY

Study in areas of current interest. Prerequisite: Permission of the Program Coordinator. (A maximum of six hours may be counted toward the MS degree.)

GSEN 5993. 3 sem. hrs. (3:0)

GRADUATE CREATIVE PROJECT

An applied research group project in geospatial surveying engineering from problem definition to implementation in an area provided by faculty in the course of study. Prerequisites: GSEN 5395 and formal approval of graduate project proposal. Offered on a satisfactory/unsatisfactory (S/U) basis only, with grade of IP until completed. Credit will not be recorded until project report is accepted by the Graduate Project Committee. May be repeated for credit. Prerequisite: Permission of the Program Coordinator.

GSEN 5998. 3-9 sem. hrs.

GRADUATE THESIS

An applied research project in geospatial surveying engineering from problem definition to implementation in an area of particular interest to the student that relates to the course of study. Prerequisites: GSEN 5395 and formal approval of graduate thesis proposal. Offered on a satisfactory/unsatisfactory (S/U) basis only, with grade of IP until completed. Credit will not be recorded until thesis is accepted by the Graduate Project Committee. May be repeated for credit. Prerequisite: Permission of the Program Coordinator. (See graduate thesis procedure under "Chronological Procedure Leading to the MS degree.")