

## DEPARTMENT OF CIVIL & ENVIRONMENTAL ENGINEERING AND LAND SURVEYING

The Department of Civil & Environmental Engineering and Land Surveying offers three undergraduate programs leading to a bachelor's degree. These are the Bachelor of Science in Civil Engineering, the Bachelor of Science in Environmental Engineering and the Bachelor of Science in Land Surveying and Mapping. The Civil and Environmental Engineering Programs are accredited by the Engineering Accreditation Commission of ABET ([www.abet.org](http://www.abet.org)). The Land Surveying and Mapping Program is accredited by the Applied and Natural Science Accreditation Commission of ABET. The Department also offers a program that leads to an Associate Degree in Land Surveying.

### LAND SURVEYING AND MAPPING PROGRAM

Land Surveying is the science of determining the position of points on the surface of the Earth through the application of mathematics and the use of specialized instruments. The term "Earth surface" refers to everything on Earth that can be explored: the bottom of the seas, bays, lakes and rivers; the interior of caves and mines; mountains and deserts; and even the frozen and desolated Polar Regions. Surveying includes the measurement of angles and distances, the establishment of horizontal and vertical control points, plan confection, cadastral measurements, highway tracing and building locations, submarine topography and oceanic depths, plus the location of legal boundaries.

### Program Mission

Provide the theoretical and technical knowledge through an educational experience that enriches the lives of program students so that they are prepared to enhance the surveying profession and protect the health and welfare of the public while expanding the base of knowledge through research and scholarship.

### Program Educational Objectives

1. Contribute to society with professionals that execute their work following the principles of moral conduct and ethics.
2. Generate graduates with the necessary knowledge and techniques to pursue an education at a graduate level.
3. Generate graduates that can be employed and successfully work in a broad range of sub-disciplines within the field.
4. Demonstrate an understanding of the need for lifelong learning via successful completion of continuous education.

### Student Outcomes

Graduates of the Land Surveying and Mapping Program will have:

1. An ability to apply knowledge of mathematics, science and Applied Sciences.
2. An ability to design and conduct experiments, as well as to analyze and interpret data.
3. An ability to design a system, component or process to meet the desired needs.
4. An ability to function on multi-disciplinary teams.
5. An ability to identify, formulate, and solve applied sciences problems.
6. An understanding of professional and ethical responsibility.
7. An ability to communicate effectively.
8. The broad education necessary to understand the impact of surveying solutions in a global and social context.
9. Recognition of the need for, and the ability to engage in lifelong learning.
10. Knowledge of contemporary issues.
11. An ability to use the techniques, skills, and modern tools necessary for professional practice.

### Career Opportunities

The Geospatial Technology industry is currently undergoing the biggest process of growth among engineering related fields. Since Land Surveying and Mapping has been recognized among those professions, therefore this study program offers great job opportunities, along with conventional surveying opportunities. The combination of theoretical knowledge supported by the multidisciplinary technologies introduced in this bachelor's degree opens a big spectrum of opportunities for diverse types of jobs.

Governmental agencies and the private sector are constantly hiring professionals to work on surveying or related projects. Real Estate Industry is another market in which our students collaborate. Accredited by ABET since 2007, this program counts with the recognition of the degree offered in Puerto Rico among the 50 States and several other jurisdictions.

### Degree Offered

The Department of Civil & Environmental Engineering and Land Surveying offers undergraduate courses leading to the degree of Bachelor of Science in Land Surveying and Mapping (BSLS). In order to get this degree, the student must complete the following minimum requirements:

**Minimum Graduation Requirements**

4	Credit-hours in Mathematics
9	Credit-hours in Basic Sciences
18	Credit-hours in Socio-Humanistic Studies and Languages
9	Credit-hours in Engineering Science and Management
33	Credit-hours in Surveying
38	Credit-hours in Geomatic Sciences
6	Credit-hours in Department Electives
3	Credit-hours in Free Elective
<b>120</b>	<b>Total Credit-hours</b>

**Developmental Studies**

All students who apply for admission and those selected who are admitted to Land Surveying and Mapping Program must show evidence that they have acquired the necessary skills and abilities to progress through this major. Those failing to do so (as reflected by the results of their College Entrance Examination Board tests, PUPR's placement test results, previous university experience, other tests, or criteria) will be required to take developmental courses. These courses are designed to help students to overcome deficiencies in languages, mathematics, and or science. These developmental courses are in addition to the 120 credits of the Land Surveying and Mapping Program. The courses are awarded their corresponding credits according to the contact hours. The courses are the following:

**Developmental Studies Component**

(Maximum of 33 Credit-Hours)

Course	Title	Credit-Hours
MATH 0102	Preparatory Mathematics	3
MATH 0106	Elementary Algebra	3
MATH 0110	Intermediate Algebra	3
MATH 1330	Precalculus I	3
MATH 1340	Precalculus II	3
SCIE 0110	Introduction to Physics	3
ATUL 0100	Adjustment to University Life	3
ENGL 0100	Preparatory English	3
ENGL 0110	English Grammar	3
SPAN 0100	Preparatory Spanish	3
SPAN 0110	Spanish Grammar	3

**Laboratories**

The Land Surveying and Mapping Program develops skills on four main laboratories: GIS and Cartography Lab, Remote Sensing and Photogrammetry Lab, Land Surveying Lab and Computer Lab. Since the surveying profession is practiced mainly in the field, practical experience with the use of our equipment is acquired in the field.

**Student Organizations**

Students enrolled in the Department can become members of the student chapter of the Institute of Land Surveyors of the College of Engineers and Land Surveyors of Puerto Rico.

**LAND SURVEYING AND MAPPING CURRICULUM**

(120 Credit-Hours)

**Mathematics Component**

(4 Credit-Hours)

Course	Title	Credit-Hours
MATH 1350	Calculus I	4

**Science Component**

(9 Credit-Hours)

Course	Title	Credit-Hours
SCIE 1210	Chemistry Principles	4
SCIE 1211	Chemistry Principles Laboratory	0

SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1

**Socio-Humanistic Studies and Languages Component**  
(18 Credit-Hours)

Course	Title	Credit-Hours
SOHU 2010	Socio-Humanistic Studies	3
SOHU 2020	Socio-Humanistic Studies II	3
ENGL 1010	The Study of the Essay as a Literary Genre	3
ENGL 2020	Business English and Communication	3
SPAN 1010	Linguistic Analysis of Literary Genres	3
SPAN 2020	Business Spanish	3

**Engineering Science and Management Component**  
(9 Credit-Hours)

Course	Title	Credit-Hours
ENGI 2260	Engineering Economics	3
CEE 2110	Engineering Geology	3
CE 3520	Construction Project Management	3

**Land Surveying Component**  
(33 Credit-Hours)

Course	Title	Credit-Hours
SURV 2202	Surveying Analysis	3
SURV 2300	Legal Aspects Surveying I	3
SURV 2302	Fundamentals of Surveying	4
SURV 2303	Fundamentals of Surveying Laboratory	0
SURV 2802	Visualization of Spatial Information	3
SURV 3204	Analysis and Adjustment of Survey Measurements	3
SURV 3306	Advanced Surveying	4
SURV 3307	Advanced Surveying Laboratory	0
SURV 3308	Surveying Practice	3
SURV 3402	Route Surveying	4
SURV 3403	Route Surveying Laboratory	0
SURV 3804	Computer Applications for Land Surveyors	3
SURV 4404	Construction Surveying	3

**Geomatic Sciences Component**  
(38 Credit-Hours)

Course	Title	Credit-Hours
GEOM 2102	Introduction to Geomatics	3
GEOM 2800	Information Systems for Land Surveyors	3
GEOM 3502	Fundamentals of Geodesy	3
GEOM 3604	Cartographic Design	3
GEOM 3606	Digital Cartography	3
GEOM 3608	Geographic Information Systems	3
GEOM 3702	Elements of Photogrammetry	4
GEOM 3703	Elements of Photogrammetry Laboratory	0
GEOM 4104	Dendrology	3
GEOM 4108	Senior Project I	1
GEOM 4109	Senior Project II	3
GEOM 4510	Global Positioning System	3
GEOM 4610	Land Development	3
GEOM 5614	Cadastral and Land Information Systems	3

**Elective Component**  
(9 Credit-Hours)

Course	Title	Credit-Hours
	Department Elective Course (*)	3
	Department Elective Course (*)	3
	Free Elective	3

(\*) Department Elective Course: any Land Surveying (SURV) elective course; or any Geomatic Sciences (GEOM) elective course; or any Real Estate Appraisal (REA) elective course; or a technical course approved by the Department Head. Those students enrolled in the Combined Bachelor's-Master's Degree Program may take a graduate level course as a Technical Elective Course with the approval of the Department Head and the Coordinator of the Graduate Program.

**Land Surveying Elective Courses**

Course	Title	Credit-Hours
SURV 2304	Legal Aspects in Surveying II	3

**Geomatic Sciences Elective Courses**

Course	Title	Credit-Hours
GEOM 4504	Surveying Space Techniques	3
GEOM 4612	The Municipal Reform Legal System	3
GEOM 4702	Introduction to Remote Sensing & Image Interpretation	3
GEOM 5600	Geospatial Information Science Fundamentals	4
GEOM 5616	GIS for Site Design	3
GEOM 5624	Special Topics in Geomatic	3

**LAND SURVEYING AND MAPPING PROGRAM CURRICULUM SEQUENCE**

**First Year**

First Quarter

Course	Title	Credit-Hours
MATH 1350	Calculus I	4
ENGL 1010	The Study of the Essay as Literary Genre	3
SPAN 1010	Linguistic Analysis of Literary Genres	3
GEOM 2102	Introduction to Geomatics	3
<b>Total</b>		<b>13</b>

1<sup>st</sup> Year - Second Quarter

Course	Title	Credit-Hours
SCIE 1210	General Chemistry I Principles	4
SCIE 1211	General Chemistry Laboratory	0
SOHU 2010	Socio-Humanistic Studies	3
GEOM 2800	Information Systems for Land Surveyors	3
	Free Elective	3
<b>Total</b>		<b>13</b>

1<sup>st</sup> Year - Third Quarter

Course	Title	Credit-Hours
SURV 2202	Surveying Analysis	3
ENGI 2260	Engineering Economics	3
SPAN 2020	Business Spanish	3
SCIE 1430	Physics I	4
SCIE 1431	Physics I Laboratory	1
<b>Total</b>		<b>14</b>

**Second Year**

## First Quarter

Course	Title	Credit-Hours
SURV 2802	Visualization of Spatial Information	3
SURV 2302	Fundamentals of Surveying	4
SURV 2303	Fundamentals of Surveying Lab	0
GEOM 3604	Cartographic Design	3
SOHU 2020	Socio-humanistic Studies II	3
<b>Total</b>		<b>13</b>

2<sup>nd</sup> Year - Second Quarter

Course	Title	Credit-Hours
SURV 3306	Advanced Surveying	4
SURV 3307	Advanced Surveying Lab	0
SURV 2300	Legal Aspects in Surveying I	3
GEOM 3502	Fundamentals of Geodesy	3
GEOM 3606	Digital Cartography	3
<b>Total</b>		<b>13</b>

2<sup>nd</sup> Year - Third Quarter

Course	Title	Credit-Hours
SURV 3402	Route Surveying	4
SURV 3403	Route Surveying Laboratory	0
GEOM 3608	Geographic Information Systems	3
GEOM 4510	Global Positioning Systems	3
ENGL 2020	Business English and Communication	3
<b>Total</b>		<b>13</b>

## Summer

Course	Title	Credit-Hours
SURV 3308	Surveying Practice	3
<b>Total</b>		<b>3</b>

## Third Year

## First Quarter

Course	Title	Credit-Hours
SURV 3204	Analysis & Adjustment of Survey Measurements	3
GEOM 4610	Land Development	3
SURV 3804	Computer Applications for Land Surveyors	3
GEOM 4104	Dendrology	3
<b>Total</b>		<b>12</b>

3<sup>rd</sup> Year - Second Quarter

Course	Title	Credit-Hours
SURV 4404	Construction Surveying	3
GEOM 3702	Elements of Photogrammetry	4
GEOM 3703	Elements of Photogrammetry Laboratory	0
CEE 2110	Engineering Geology	3
GEOM 4108	Senior Project I	1
CE 3520	Construction Project Management	3
<b>Total</b>		<b>14</b>

3<sup>rd</sup> Year - Third Quarter

Course	Title	Credit-Hours
	Dept. Elective	3
	Dept. Elective	3
GEOM 5614	Cadastral & Land Information Systems	3
GEOM 4109	Senior Project II	3
	<b>Total</b>	<b>12</b>

### COURSE DESCRIPTIONS

#### Land Surveying Courses

##### **SURV 2095 – PRINCIPLES OF SURVEYING FOR ENGINEERS LAB ENGINEERS**

One credit-hour. Three hours per week and field laboratory. Prerequisites: ENGI 1140, ENGI 2210

Through conferences and field practices, the student will learn the basic surveying concepts applicable for route design and construction of route.

##### **SURV 2202 – SURVEYING ANALYSIS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: MATH 1340

Analytical geometry review and elements of linear algebra as applied to the analysis of land surveying problems; and introduction to plane surveying calculations.

##### **SURV 2300 – LEGAL ASPECTS IN SURVEYING I**

Three credit-hours. Two two-hour lecture period per week. Prerequisite: GEOM 2102

Aspects of Local and Federal legal system related to the professional Surveyor practice. Ethical principles in the surveying profession. Legal aspects of the federal Retract Systems. Federal surveying practices.

##### **SURV 2302 – FUNDAMENTALS OF SURVEYING**

Four credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 2202 and MATH 1350. Corequisite: SURV 2303

The theory and practice of land surveying. Measurement of difference in elevations using leveling network. Measurement of distances using tapes and other methods; also measurement of angles. Application to boundary identification.

##### **SURV 2303 – FUNDAMENTALS OF SURVEYING LABORATORY**

Zero credit-hours. One four-hour laboratory period per week. Prerequisites: SURV 2202 and MATH 1350. Corequisite: SURV 2302

Laboratory practice of land surveying related to course SURV 2302. The practices will concentrate on the uses of Land Surveying Instruments. Measurement of difference in elevations using differential and trigonometric leveling. Measurement of distances using tapes and other methods; also measurement of angles. Application to Traverse and Polygonal closure.

##### **SURV 2304 – LEGAL ASPECT IN SURVEYING II**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: SURV 2300

Aspects of Local legal system related to the professional Surveyor practice. Ethical principles in the surveying profession. Surveying permit regulations applicable.

##### **SURV 2802 – VISUALIZATION OF SPATIAL INFORMATION**

Three credit- hours. Two two-hour lecture periods per week. Prerequisites: GEOM 2800, MATH 1340

Basic knowledge of spatial information management and visualization using computer software (CAD).

##### **SURV 3204 – ANALYSIS AND ADJUSTMENT OF SURVEY MEASUREMENT**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 3306 (MIN C), SURV 3307

The concept of measurement, precision and accuracy, random, systematic and blunder errors are introduced in this course. Probability, reliability and statistical testing applied to analysis of survey data. Error propagation and alignment, and some examples of least-squares adjustment method are presented in this course.

#### **SURV 3306 – ADVANCED SURVEYING**

Four credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 2302, SURV 2303, Concurrent: SURV 3307

Use of conventional signs to make sketches and field notes. Selection and use of equipment for topographic survey. Carrying out the topographic survey in the field. Computation of the results of the survey, plot of the points (manually and computer-assisted). Interpolation of contour lines. Area and volume computation.

#### **SURV 3307 – ADVANCED SURVEYING LABORATORY**

Zero credit-hours. One four-hour laboratory period per week Prerequisites: SURV 2302, SURV 2303, Concurrent: SURV 3306

Laboratory and field practice related to Advanced Surveying course topics.

#### **SURV 3308 – SURVEYING PRACTICE**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 3402 and SURV 3403

Discussion and development of land surveying project. The course will require field work, boundary and topography survey, design of evidence gathering, resurvey, retracement and analysis techniques for complex Land Survey System, riparian, mineral, land-grant and fraudulent surveys; case studies.

#### **SURV 3402 – ROUTE SURVEYING**

Four credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 3306, SURV 3307 Concurrent SURV 3403

Geometric properties and design elements of horizontal and vertical alignment needed for the design and layout of routes.

#### **SURV 3403 – ROUTE SURVEYING LABORATORY**

Zero credit-hours. One four-hour laboratory period per week. Prerequisites: SURV 3306, SURV 3307; Concurrent SURV 3402

Laboratory practice of the main concepts related to course SURV 3402: Route Survey. The practices will concentrate in the application of geometric properties and design elements of horizontal and vertical alignment needed for the design and layout of routes.

#### **SURV 3804 – COMPUTER APPLICATION FOR LAND SURVEYORS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 2302, SURV 2303, SURV 2802

Computer applications used for the land surveying professional practice. Computer drafting.

#### **SURV 4404 – CONSTRUCTION SURVEYING**

Three credit-hours. Two two-hour lecture periods per week and field laboratory. Prerequisites: SURV 3402, SURV 3204

Principles of construction surveying as used in various types of construction projects.

### **Geomatic Sciences Courses**

#### **GEOM 2102 – INTRODUCTION TO GEOMATICS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

Geomatics comprises the science, technology, and art involved in the measurement, representation, analysis, management, retrieval and display of spatial data concerning both the Earth's physical features and the built environment. It includes cadastral surveying, mapping sciences, land management, geographic information systems, geodesy, photogrammetry, remote sensing, hydrographic surveying and surveying ocean mapping. It has applications in all disciplines which depend on spatial data, including environmental studies, planning, engineering, navigation, geology and geophysics, oceanography, land development, land ownership, land administration and land use management. It is thus fundamental to all the geosciences disciplines which use spatially related data.

This course offers the student an introduction to the fundamentals of these topics, a review of historic events and future of the profession.

**GEOM 2800 – INFORMATION SYSTEMS FOR LAND SURVEYORS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: None

In this course the students will develop skills in the use of computers, component, operative systems, printers, plotters, scanners, graphics, digital images, software, presentation and written data used in the presentation. They will also be introduced to information systems concepts and the appropriate techniques for effective administration and the use of them. The course will place special attention to the design, development and management of databases either for office management or Geographic Information Systems.

**GEOM 3502 – FUNDAMENTALS OF GEODESY**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 2302 and SURV 2303

Introduce the concepts of geodesy, geoids, earth gravity field. Relate Geodesy to other geosciences. Introduce the integrated Global Geodetic Observing System (IGGOS) and the concept of geodetic network.

**GEOM 3604 – CARTOGRAPHIC DESIGN**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: GEOM 2102

Introduction to concepts and theories of cartographic design. Special attention to cartographic modeling and visualization through the use of thematic cartography concepts.

**GEOM 3606 – DIGITAL CARTOGRAPHY**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: GEOM 3604

Introduction to digital cartography concepts. The course covers techniques, error handling and software used for the creation of vector and raster data.

**GEOM 3608 – GEOGRAPHIC INFORMATION SYSTEMS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: GEOM 3606 (Minimum C), SURV 2302 and SURV 2303

Discussion of topics related to design, development and application of Geographic Information Systems. Emphasis on problem-solving using appropriate modeling tools.

**GEOM 3702 – ELEMENTS OF PHOTOGRAMMETRY**

Four credit hours. Two two-hour lecture periods per week and field laboratory. Prerequisites: SURV 3306 and SURV 3307. Corequisite: GEOM 3703

Principles of Photogrammetry using aerial and terrestrial photography. History of photogrammetry, aerial cameras and camera calibration, geometry of the aerial photograph, stereoscopy and stereoscopes, parallax, and the theory and techniques of orientation. Stages of planning, flight design, and the terrestrial controls in Photogrammetry surveys.

**GEOM 3703 – ELEMENTS OF PHOTOGRAMMETRY LABORATORY**

Zero credit-hours. One four-hour laboratory period per week. Prerequisites: SURV 3306 and SURV 3307. Corequisite: GEOM 3702

Laboratory practice for the GEOM 3702: Elements of Photogrammetry course.

**GEOM 4104 – DENDROLOGY**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: SURV 2302 and SURV 2303

Introduction to trees, their identifying characteristic, habitats, distribution, and systematic classification.

**GEOM 4108 – SENIOR PROJECT I**

One credit-hour. One two-hour lecture periods per week. Prerequisites: SURV 3308, GEOM 4610, and Department Head Authorization.



Senior Project research proposal. Thru their respective research, students should be able to apply the skills and knowledge acquired in their previous years of study to a land surveying related research. Individual presentations will be made to the professors during the quarter. At the end of the quarter, final presentations will be made to a panel of professor. Approval of the research proposal should wrap-up this course.

#### **GEOM 4109 – SENIOR PROJECT II**

Four credit-hours. Two two-hour lecture periods per week. Prerequisites: GEOM 4108 and Department Head Authorization.

Implementation of the student's research proposed in Senior Project I course. Thru the research students should be able to apply the skills and knowledge acquired in their previous years of study. At the end of the quarter, a public defense of the research will be made to a panel of professor. Technical report should wrap-up this course.

#### **GEOM 4112 – SENIOR PROJECT II Extension**

Zero credit-hours. Prerequisites: Department Head Authorization.

Course that provides the student the opportunity to continue the development of his/her Senior Project II.

#### **GEOM 4504 – SURVEYING SPACE TECHNIQUES**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: GEOM 3502

The very basic principles of satellite geodesy and the concept of satellite positioning techniques will be introduced. Satellite Laser Ranging, altimetry, and Very Long Baseline, Interferometry will be discussed briefly.

#### **GEOM 4510 – GLOBAL POSITIONING SYSTEM**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: GEOM 3502

Fundamentals of coordinate systems used in satellite geodesy, importance of the earth's gravity field and perturbation forces acting on the satellites will be introduced. Elements of planning and carrying out GPS-survey will be discussed.

#### **GEOM 4610 – LAND DEVELOPMENT**

Three credit-hours. Two two-hour lecture periods per week and field laboratory. Prerequisite: GEOM 3608

This course covers a discussion on the principles and regulations governing the use and development of land. Historic review of land use patterns in Puerto Rico. Revision of zoning and subdivision regulations used in Puerto Rico.

#### **GEOM 4612 – THE MUNICIPAL REFORM LEGAL SYSTEM**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: GEOM 4610

Land Use planning and development process at the municipal level changed with adoption of Law 81 of August of 1991, better known as *Ley de Municipios Autónomos* (Municipal Reform Law). This course emphasizes on topics of this law, especially the ones related to land use planning process.

#### **GEOM 4702 – INTRODUCTION TO REMOTE SENSING & IMAGE INTERPRETATION**

Three credit-hours. Two two-hour lecture periods per week. Prerequisites: GEOM 3702 and GEOM 3703

This course introduces the students to the principles of image interpretation. The interpretation is based on aerial photographs and satellite imagery. At the end of the course students should be able to correctly use remote sensing imagery. Also, they will be able to analyze and understand the basic concepts in the field.

#### **GEOM 5600 – GEOSPATIAL INFORMATION SCIENCE FUNDAMENTALS**

Four credit-hours. One four-hour lecture per week. Prerequisite: None

This course provides an introduction to the principles and concepts necessary to work in a digital cartographic environment, especially in the context of geographic information systems (GIS). The course also introduces the student to the basic concepts of performing spatial analyses using a geographic information system (GIS). The first part of the course gives an overview of basic cartography and mapping concepts and theories, which are fundamental to understanding and using a GIS. The second part of the course focuses on

concepts and theories of GIS, including some of its analysis capabilities. Other technologies such as remote sensing and global navigation satellite systems will be discussed.

**GEOM 5614 – CADASTRAL & LAND INFORMATION SYSTEMS**

Three credit hours. Two two-hour lecture periods per week. Prerequisite: GEOM 3608

Principles of cadastral systems, their history and contemporary development globally and in Puerto Rico. Emphasis on Land Information Systems and multipurpose cadastre.

**GEOM 5616 – GIS FOR SITE DESIGN**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: None

This is an introductory to intermediate-level GIS course that focuses on the application of geographic information systems in the practice of urban and regional planning, with a focus on site design. Topics covered will include data models and structures, coordinate systems and projections, thematic mapping, spatial analysis, acquisition and integration of spatial data from various sources, and GIS application development.

**GEOM 5624 – SPECIAL TOPICS IN GEOMATICS**

Three credit-hours. Two two-hour lecture periods per week. Prerequisite: Director Approval

Advanced seminar dealing with topics in Geomatic Sciences, to be selected according to staff and student interests. The course will be designed to address professional current events, advanced skills, special knowledge, and/or particular topics of interest.

**DEPARTMENTAL FACULTY**

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