

# FLORIDA ATLANTIC UNIVERSITY™

## Graduate Programs—PROGRAM CHANGE REQUEST

UGPC APPROVAL \_\_\_\_\_  
 UFS APPROVAL \_\_\_\_\_  
 CATALOG \_\_\_\_\_

DEPARTMENT: CIVIL , ENVIRONMENTAL AND GEOMATICS  
 ENGINEERING

COLLEGE: ENGINEERING AND COMPUTER SCIENCE

PROGRAM NAME: MASTER'S DEGREE IN COMPUTER AND ELECTRICAL ENGINEERING

**EFFECTIVE DATE**

(PROVIDE TERM/YEAR)

PLEASE EXPLAIN THE REQUESTED CHANGE(S) AND OFFER RATIONALE BELOW AND/OR ATTACHED:

THIS PROPOSAL UPDATES THE CATALOG WHICH HAS NOT BEEN UPDATED IN YEARS. ALL THE CHANGES ARE DE MINIMIS. THESE HAVE BEEN APPROVED BY THE DEPARTMENT GRADUATE COMMITTEE.

Faculty contact, email and complete phone number:  
 Frederick Bloetscher, Ph.D., P.E.  
 239-250-2423

Consult and list departments that might be affected by the change and attach comments.  
**None – the change is only to this department based on classes offered**

*Approved by:*

Department Chair: \_\_\_\_\_

College Curriculum Chair: \_\_\_\_\_

College Dean: \_\_\_\_\_

UGPC Chair: \_\_\_\_\_

Graduate College Dean: \_\_\_\_\_

UFS President: \_\_\_\_\_

Provost: \_\_\_\_\_

*Date:*

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Email this form and syllabus to [UGPC@fau.edu](mailto:UGPC@fau.edu) one week before the University Graduate Programs Committee meeting so that materials may be viewed on the UGPC website prior to the meeting.

# Civil, Environmental and Geomatics Engineering

## Faculty:

Yong, Y., Chair; Arockiasamy, M.; Berber, M.; Bloetscher, F.; Bober, W.; De Groff, D.; Gibson, L.; Kaisar, E.; Meeroff, D. E.; Nagarajan, S.; Reddy, D. V.; Rosson, B.; Scarlatos, P. D.; Sobhan K.; Stevanovic, A.; Teegavarapu, R.

## Affiliated Faculty:

Gammack-Clark, J.; Roberts, C.; Root, T.; Xie, Z.; Zhang, C.

## Adjunct Faculty:

Leone, D. J.; George, K. P.; Muniz, A.; Munuswamy, S.; Zheng, X.

The Department of Civil, Environmental and Geomatics Engineering offers programs of study leading to the Bachelor of Science in Civil Engineering (B.S.C.V.), Master of Science (M.S.) with major in Civil Engineering and Bachelor of Science in Geomatics Engineering (B.S.G.E.). To encourage undergraduates to pursue a graduate education, the Department also offers a combined B.S.C.V. to M.S. degree program that permits a student to complete both a bachelor and a master degree in Civil Engineering within five years.

## Civil Engineering

Civil engineers design the constructed environment that supports our society. From highways and buildings to bridges and water systems, the profession of civil engineering is responsible for much of the world in which we live.

The program of study leading to the Bachelor of Science in Civil Engineering (B.S.C.V.) reflects the breadth of the profession. Students complete coursework in basic science and mathematics, engineering sciences, civil engineering systems and materials, and the major disciplines in civil engineering. Because of the tremendous impact civil engineers have on society, the curriculum also requires students to pursue studies in the social sciences and the humanities by completing the Intellectual Foundations Program.

The program of study leading to the Master of Science (M.S.) with major in Civil Engineering is designed to meet the advanced civil engineering educational needs of recent graduates of undergraduate engineering programs, practicing engineers and those non-engineering professionals wishing to redirect their career paths.

## Civil Engineering Vision and Mission

The Civil Engineering program delivers the highest quality educational and research opportunities throughout the FAU service area and beyond and makes a significant contribution to the needs of a changing South Florida community.

Civil Engineering serves the technological needs of society, especially with regard to the constructed environment in South Florida. It produces a diverse population of engineers, each

possessing a superior technical foundation and a rigorous liberal education. It creates new opportunities for the communities and industries of South Florida and beyond.

Through individual dedication, the faculty, administrators and staff contribute to the Department's group success. They value ethical behavior, critical thinking, innovation, individual responsibility, thoughtful risk taking, teamwork and leadership. They also value a balanced, holistic approach to life, in which the well-being of each member of the community has primacy. In this way, their actions educate at least as well as their words.

### **Educational Objectives and Outcomes**

The Civil Engineering program strongly supports the educational objectives and learning outcomes of the College of Engineering and Computer Science (see the Educational Objectives and Expected Student Learning Outcomes subsections previously listed in this section).

For undergraduate Civil Engineering students, the Department has established the following additional educational objectives at the program level:

1. **Preparation for Practice:** Graduates will be prepared for entry-level positions in their discipline and for graduate/professional studies.
2. **Tools for Creativity:** Graduates will experience the creative and design processes and their application to typical engineering situations.
3. **Societal Awareness:** Graduates will receive the breadth of education necessary to integrate practice in their disciplines with the needs and interests of a diverse modern society.
4. **Leadership Skills:** Graduates will be prepared for leadership in their discipline.

The Civil Engineering program outcomes are:

- a) An ability to apply knowledge of mathematics, science, and engineering.
- b) An ability to design and conduct experiments, as well as to analyze and interpret data.
- c) An ability to design a system, component, or process to meet desired needs within realistic constraints such as economic, environmental, social, political, ethical, health and safety, manufacturability and sustainability.
- d) An ability to function on multi-disciplinary teams.
- e) An ability to identify, formulate, and solve engineering problems.
- f) An understanding of professional and ethical responsibility.
- g) An ability to communicate effectively.

- h) The broad education necessary to understand the impact of engineering solutions in a global, economic, environmental, and societal context.
- i) A recognition of the need for, and an ability to engage in life-long learning.
- j) A knowledge of contemporary issues.
- k) An ability to use the techniques, skills, and modern engineering tools necessary for engineering practice.

For graduate Civil Engineering students, the following additional educational outcomes are established. Graduates will have:

1. Knowledge in civil engineering and related subjects significantly beyond the baccalaureate level;
2. The ability to independently conduct research or a significant practice-oriented project in civil engineering;
3. The ability to communicate ideas and results in written, oral and graphical forms.

These educational outcomes result from successful completion of a well-planned, rigorous set of courses and a major capstone experience (either a thesis or practice-oriented project).

Students wishing to continue their education but not pursue a formal academic degree are welcome to take graduate courses with the appropriate technical preparation.

## **Bachelor's Program**

### **Bachelor of Science in Civil Engineering**

#### **Admission Requirements**

All students must meet the minimum admission requirements of the University. Please refer to the Admissions section of this catalog.

All students must meet the pre-professional requirements listed above to be accepted in the Civil Engineering program.

#### **Prerequisite Coursework for Transfer Students**

Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through

the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the prerequisite courses for their major as outlined in the *Transfer Student Manual* (see [www.fau.edu/registrar/tsm.php](http://www.fau.edu/registrar/tsm.php)).

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

### Coursework for Transfer Students

To minimize the time necessary to complete the Civil Engineering degree, transfer students entering the University with an A.A. degree should structure their programs to include the following:

Topics	Credits (1)	
English Composition	6	(two 3-credit courses)
Social Science	6	(two 3-credit courses)
Humanities	6	(two 3-credit courses)
Complete Calculus Sequence	12	(three 4-credit courses)
Ordinary Differential Equations	3	(one 3-credit course)
General Chemistry, with Lab	4	(one 4-credit course, including lab)
Calculus based Physics, with Labs	8	(two 4-credit courses, including labs)
Computer Programming (2)	3	(one 3-credit course)
Fundamentals of/Introduction to Engineering (3)	3	(one 3-credit course)
Additional Electives (4)	6	(two 3-credit courses)

Notes:

(1) The number of credits may vary by institution.

(2) Software applications courses are not computer programming courses.

(3) An introductory course in engineering is preferred. However, substitutions may be allowed, provided they are part of a cohesive pre-engineering A.A. degree program.

(4) Some institutions offer engineering fundamentals courses that may fulfill degree requirements. See degree requirements below.

### Degree Requirements

The Bachelor of Science in Civil Engineering degree will be awarded to students who:

1. Meet all general degree requirements of the University;
2. Complete the curriculum for the B.S. in Civil Engineering degree (see below);
3. Take the Fundamentals of Engineering examination (the first of two exams necessary for professional licensure; contact the Department for details).

### Curriculum

The Bachelor of Science in Civil Engineering degree requires 128 credits. For credit toward the degree, a grade of "C" or better must be received in each course listed. In addition, all prerequisites for each mathematics, science or engineering course must be completed with a grade of "C" or better before enrollment is permitted. The degree components are listed below.

General Studies		
College Writing 1 (1),(2)	ENC 1101	3
College Writing 2 (1),(2)	ENC 1102	3
Intellectual Foundations Program Society and Human Behavior Courses (1), (3)		6
Intellectual Foundations Program Global Citizenship Courses (1),(3)		6
Intellectual Foundations Program Creative Expressions Courses (1),(3)		6
<b>Total</b>		<b>24</b>

Basic Mathematics and Sciences		
Calculus for Engineers 1 (1),(4)	MAC 2281	4
Calculus for Engineers 2 (1),(4)	MAC 2282	4
Calculus with Analytic Geometry 3	MAC 2313	4
Engineering Mathematics 1	MAP 3305	3
Probability and Statistics for Engineers	STA 4032	3
Engineering Chemistry (1)	EGN 2095	3
Engineering Chemistry Lab (1)	EGN 2095L	1
Physics for Engineers 1 (1),(5)	PHY 2043	3
General Physics 1 Lab	PHY 2048L	1
Physics for Engineers 2 (1),(5)	PHY 2044	3
General Physics 2 Lab	PHY 2049L	1
Fundamentals of Surveying	SUR2104C	3
<b>Total</b>		<b>33</b>

Engineering Fundamentals		
Fundamentals of AutoCAD	CGN 2327	3
Fundamentals of Engineering	EGN 1002	3
Computer Applications in Engineering I	EGS 2213	3
Statics	EGN 3311	3
Dynamics	EGN 3321	3
Strength of Materials	EGN 3331	3
Engineering Thermodynamics	EGN 3343	3
Total		21

Professional Core (6)		
Soil Mechanics (7)	CEG 3011C	3
Foundation Engineering	CEG 4012	3
Analysis of Structures (7)	CES 3102C	3
Structural Steel Design	CES 4605	3
Reinforced Concrete Design	CES 4702	3
Civil Engineering Materials (7)	CGN 3501C	3
Civil Engineering Design 1 (2, 4, 7)	CGN 4803C	3
Civil Engineering Design 2 (2, 4, 7)	CGN 4804C	3
Undergraduate Research in Civil Engineering 1	CGN3910	1
Undergraduate Research in Civil Engineering 2	CGN4910	1
Applied Hydraulics (7)	CWR 3201C	3
Hydrologic Engineering	CWR 4202	3
Environmental Science and Engineering (7)	ENV 3001C	3
Water and Wastewater Treatment Systems	ENV 4514	3
Introduction to Transportation Engineering (7)	TTE 3004C	3
Transportation Planning and Logistics (7)	TTE 4005C	3
Total		44

Technical Electives (8)		
Students select 6 credits from a list of approved technical electives.		
Construction Project Management	CCE 4031	3
Pavement Design	CEG 4126	3
GIS Application in Civil Engineering	CGN 4321	3
Advanced Hydraulic Systems	CWR 4223	3

Stormwater Modeling and Management	CWR 4307	3
Seminar in Transportation Planning and Management	TTE 4105	3
Total		6

Notes:

- (1) Contributes to University Core Curriculum requirements.
- (2) Contributes to Writing Across Curriculum (WAC or Gordon Rule) writing requirement.
- (3) Intellectual Foundations Program courses totaling 6 credits, must be selected to satisfy Writing Across Curriculum (Gordon Rule) writing requirements.
- (4) Contributes to Gordon Rule mathematics requirement.
- (5) PHY 2048 and PHY 2049 (4 credits each) are acceptable substitutes, but only 6 credits will apply toward the degree.
- (6) All professional core courses contain a communications component (writing or speaking).
- (7) Includes laboratory.
- (8) 6 credits may be taken from Civil Engineering graduate courses – this is highly recommended for students planning to pursue the B.S.M.S. Program.

Sample Four-Year Program of Study for Bachelor of Science in Civil Engineering

First Year, Fall (14 credits)		
College Writing 1	ENC 1101	3
Engineering Chemistry	EGN 2095	3
Engineering Chemistry Lab	EGN 2095L	1
Calculus for Engineers 1	MAC 2281	4
Fundamentals of Engineering	EGN 1002	3

First Year, Spring (14 credits)		
College Writing 2	ENC 1102	3
Physics for Engineers 1	PHY 2043	3
General Physics 1 Lab	PHY 2048L	1
Calculus for Engineers 2	MAC 2282	4



Fundamentals of AutoCAD	CGN2327	3
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Second Year, Fall (14 credits)		
Physics for Engineers 2	PHY 2044	3
General Physics 2 Lab	PHY 2049L	1
Calculus with Analytic Geometry 3	MAC 2313	4
Fundamentals of Surveying	SUR 2104C	3
Intellectual Foundation Program Course		3

Second Year, Spring (15 credits)		
Statics	EGN 3311	3
Engineering Mathematics 1	MAP 3305	3
Computer Applications in Engineering	EGS 2213	3
Intellectual Foundation Program Courses		6

Second Year, Summer (9 credits)		
Strength of Materials	EGN 3331	3
Engineering Thermodynamics	EGN 3343	3
Intellectual Foundation Course		3

Third Year, Fall (15 credits)		
Analysis of Structures	CES 3102C	3
Civil Engineering Materials	CGN 3501C	3
Applied Hydraulics	CWR 3201C	3
Probability and Statistics for Engineers	STA 4032	3
Introduction to Transportation Engineering	TTE 3004C	3

Third Year, Spring (16 credits)		
Soil Mechanics	CEG 3011C	3
Environmental Science and Engineering	ENV3001C	3
Dynamics	EGN 3321	3
Undergraduate Research in Civil Engineering 1	CGN 3910	1
Intellectual Foundation Program Courses		6

Fourth Year, Fall (16 credits)		
Foundation Engineering	CEG 4012	3
Structural Steel Design	CES 4605	3
Reinforced Concrete Design	CES 4702	3
Civil Engineering Technical Elective		3
Undergraduate Research in Civil Engineering 2	CGN 4910	1
Civil Engineering Design 1	CGN 4803C	3

Fourth Year, Spring (15 credits)		
Civil Engineering Design 2	CGN 4804C	3
Hydrologic Engineering	CWR 4202	3
Transportation Planning and Logistics	TTE 4005C	3
Water and Wastewater Treatment Systems	ENV 4514	3
Civil Engineering Technical Elective		3

### **Minors and Certificate Programs Appropriate for Civil Engineering**

Civil engineering is a uniquely wide-ranging profession. Various departments offer minors and certificate programs relevant to a student's civil engineering education. The faculty encourages students to pursue a minor or certificate, such as:

**Geomatics Engineering Certificate** (Department of Civil, Environmental and Geomatics Engineering) (highly recommended);

**Geomatics Engineering Minor** (Department of Civil, Environmental and Geomatics Engineering) (highly recommended); and

**Geographic Information Systems Certificate** (Department of Geosciences).

Obtaining a minor or certificate will require the completion of credits beyond the 128 required for the B.S. in Civil Engineering. Contact the department offering the minor or certificate for more details.

### **Cooperative Education**

Civil Engineering students are strongly encouraged to gain practical experience through participation in Cooperative Education. However, Cooperative Education does not substitute for the civil engineering technical elective. For information, contact the Department co-op advisor or the Office of Engineering Career Development at 561-297-2694. No credit is offered for co-op, but the experience is highly recommended.

## Combined degree Program

### B.S.C.V. to M.S. Degree Program

With an approximate duration of five years, the combined Bachelor of Science in Civil Engineering to Master of Science program provides an attractive way for students to continue their graduate work. Students may count 6 credits of approved undergraduate coursework toward both their B.S.C.V. and M.S. degrees. One of the two courses must be at the graduate level class offered in their area of interest or as a general class (see descriptions).

To be eligible for the joint B.S.C.V./M.S. program, students must:

1. Have a cumulative GPA of 3.25 or higher (FAU and transfer courses);
2. Have a total institution GPA of 3.25 or higher (FAU courses); and
3. Formally apply to the joint program, completing the admissions process at least one semester prior to beginning the M.S. portion of the program.

## Master's Program

### Master of Science with Major in Civil Engineering

The mission of the Master of Science with Major in Civil Engineering program is to meet the advanced civil engineering educational needs of recent graduates of undergraduate programs, practicing engineers and those non-engineering professionals wishing to redirect their career paths. Graduates of the program possess these attributes or educational outcomes:

1. Knowledge in civil engineering and related subjects significantly beyond the baccalaureate level;
2. Ability to independently conduct research and/or solve a significant practice-oriented project in civil engineering;
3. Ability to communicate ideas and results professionally in written, oral and graphical forms.

These educational outcomes result from successful completion of a well-planned, rigorous set of courses and a major capstone experience (either a thesis or practice-oriented project).

Students wishing to continue their education but not pursue a formal academic degree are welcome to take graduate courses with the appropriate technical preparation.

## Admission Requirements

All applications are reviewed on a case-by-case basis. Students with non-engineering bachelor's degrees, click [here](#) for additional requirements. Students are normally admitted to the Master of Science in Civil Engineering program if they:

1. Possess a baccalaureate degree in Civil Engineering or a closely related engineering field. Students with international degrees must have their credentials evaluated by an approved evaluator. Contact the Graduate College for more information. Prospective students without an engineering degree will be evaluated on a case-by-case basis;
2. Have achieved a 3.0 (on a 4.0 scale) grade point average in the last 60 credits of undergraduate work;
3. Have achieved scores of at least 145 (verbal) and 150 (quantitative) on the Graduate Record Examination (GRE). GRE scores cannot be more than five years old and must be completed before admission to the program;
4. Have demonstrated proficiency in both written and spoken English. Students from non-English-speaking countries are required to take the Test of English as a Foreign Language (TOEFL) and achieve a score of 550 or 213 (computer-based);
5. Have provided three letters of recommendation attesting to the student's potential for graduate studies in civil engineering;
6. Agree to abide by the graduate admission requirements of the University as published in the University Catalog;
7. If, as distance learning (DEDECS) students, the student has indicated to the Department their intention to pursue a master's degree by the end of the third DEDECS class taken at FAU.

### Degree Requirements

The degree of Master of Science with major in Civil Engineering is awarded to the candidate who has:

1. Complied with University graduate policies and regulations;
2. Satisfied the University's graduate degree requirements;
3. Satisfactorily completed the appropriate Plan of Study for the degree option selected.

### Plan of Study

A Plan of Study is a set of courses and a thesis or project activity chosen and completed in a sequence that meets the needs and interests of the individual student and the degree requirements

and other stipulations of the University, College of Engineering and Computer Science and the Department. Prior to or immediately upon admission to the program, students should discuss their options with the graduate advisor for the Department. There is no requirement for master's students to be full-time, nor is there an on-campus service requirement. The Plan of Study must be approved by the graduate advisor and the student's supervisory committee no later than the end of the student's first semester in the program, regardless of the number of credits earned. After this time, modifications must be approved by the supervisory committee.

## Degree Options

Two options are available to students pursuing the M.S. in Civil Engineering degree: the thesis option and the project option. Both options are described below. In each case, a minimum cumulative grade point average of 3.0 is required on all coursework attempted.

### Master of Science with Major in Civil Engineering (with Thesis)

This degree requires a minimum of 30 credits: 24 credits of coursework following one of the program concentrations and a 6-credit thesis that is successfully completed and defended at an oral examination. Up to 6 credits may come from 4000-level undergraduate courses. All students receiving financial support from the Department are required to complete the thesis option.

### Master of Science with Major in Civil Engineering (with Project)

This degree requires a minimum of 33 credits: 30 credits of coursework following one of the program concentrations and a 3-credit, practice-oriented project. Up to 6 credits may come from 4000-level undergraduate courses.

This catalog contains statements of regulations that apply to all graduate students. Of particular interest are the sections on Admissions, Degree Programs and Degree Requirements. Statements referring to foreign language requirements do not apply to Civil Engineering Master of Science majors.

## Program Concentrations

Areas of concentration are :

- Structural/Geotechnical Engineering
- Transportation/Geomatics Engineering
- Water Resources/Environmental Engineering

All M.S. in Civil Engineering students, without exception, complete one concentration which includes a minimum of two core classes, plus two general classes and any other graduate courses As designated by the advisor. Thus, considerable breadth in the student's program is possible. All course selections must be part of an approved program of study.

General Classes	
Finite Element Methods in Civil Engineering	CES 6119
Pavement Analysis and Design	CEG 6129
Geotechnology of Waste Management	CEG 6113
Advanced Hydraulics – Pumping and Piping Design and Construction	ENV5565
Groundwater Flow	CWR 6125
Geographic Information Systems	CGN 5308
Civil Engineering Project Management	CCE 5036
Infrastructure System Management	CGN 6506
Storm Water Management	CGN 5305

Structural/GeotechnicalEngineering Core	
Prestressed Concrete	CES 6715
Structural Dynamics	CES 6585
Advanced Reinforced Concrete	CES 6706

Transportation/Geomatics Engineering	
Core	
Sustainable Public Transportation	TTE 6651
Highway Engineering	TTE 6507
Maritime Freight and Cargo	TTE 6506

Water Resource/Environmental Engineering	
Core	
Water Supply and Treatment	ENV 6418

Wastewater Engineering	ENV 6507
Water Resource System Engineering	CWR 6818
Dynamic Hydrology	CWR 6525

Depth (select two as offered)	
Advanced Structural Analysis	CES 6106
Bridge Design	CES 6325
Advanced Steel Structures	CES 6607
Soil Stabilization and Geosynthetics	CE G 612 4
Numerical Methods in Geotechnical Engineering CEG 6505 Advanced Soil Mechanics	CEG 6015
Advanced Mechanics of Materials for Civil Engineering	CES 6107
Advanced Foundation Engineering	CEG 6105
Transportation and Supply Chain Management	TTE 6507
Intelligent Transportation Systems	TTE 6272
Traffic Signal Systems	TTE 6256
Terrestrial Laser Scanning	CEG 5304
Railroad Engineering Design	TTE 6700
Modeling Methods in Water Resources and Environmental Engineering	EES 6025
Environmental Systems and Processes	ENV 6668
Air Pollution and Control	ENV 6115
Solid Waste Management	ENV 6356
Open Channel Hydraulics	CWR 6235
River Mechanics and Sediment Transport	CWR 6236
Stormwater Modeling and Management	CWR 5308

#### Business Minor

Students electing to receive a Business minor complete 15 credits selected from the College of Business approved course list found at the beginning of this College of Engineering and

Computer Science section under the heading Business Minor. Up to 6 credits of electives may be used to satisfy this requirement. The remaining 9 credits are in addition to the total credits normally required for the M.S. degree in Civil Engineering. Thus, with the Business minor, at least 39 credits of coursework are required for the thesis option and 42 credits for the project option.

### Admission to Candidacy

The Plan of Study must be approved and formally submitted to the Graduate College no later than the end of the student's first semester in the program, regardless of the number of credits earned. The Plan of Study includes all coursework and thesis work that the student expects to complete for the M.S. degree.

For students electing one of the project options, the same process should be followed. However, the orientation of the project should be toward solving an established problem (including a brief research component and comparison of options) that will demonstrate the advanced application of engineering principles. The project should be identified by the end of the student's second semester in the program regardless of the number of credits completed.

### Program Supervision

The Department has a graduate advisor who will help all graduate students with course selections as they progress toward their degree and ensure students meet all requirements. The graduate advisor will assist students with identifying interest areas, thesis or project topic ideas, which will lead to the student's selection of the student's committee chair.

All students (thesis or project option) must select a supervisory committee. The supervisory committee must contain at least three members. The supervisory committee will review and approve the student's program of study. The chair of the committee and at least one of the other members must be chosen from the Department faculty. The third member may be chosen from the Department faculty or from outside the Department in accordance with the University guidelines established in the Graduate Governance document. The third member may be a professional from the practicing engineering community. All members of the committee should have doctoral degrees.

The student should obtain the consent of all members to serve on the supervisory committee. The supervisory committee also acts as the research committee and guides the development and completion of the thesis. Thus, the supervisory committee members should be selected so that areas relevant to the thesis research are fully represented. The Department graduate advisor provides overall supervision of all graduate programs.

### The Thesis

The master's thesis is a comprehensive original work that contributes to the understanding of an



engineering problem. Students can expect to focus much of their academic effort for at least two semesters on completion of a thesis. Students planning to continue graduate studies to the doctoral level are strongly encouraged to select the thesis option. The supervisory committee approves the thesis topic as part of the Plan of Study.

The thesis is presented at an oral defense, the time and date of which must be approved by the supervisory committee. A minimum of two weeks prior to the anticipated defense, the written thesis must be delivered to the supervisory committee in the format described in a pamphlet titled Requirements and Guidelines for Graduate Theses and Dissertations that is available from the FAU Graduate College. The time and location of the defense will be announced to the entire College of Engineering and Computer Science community through email and physical postings one week prior to the scheduled defense.

The supervisory committee determines the format of the defense and, in private consultation at the completion of the oral defense, whether or not the defense was successful and the thesis is acceptable in scope and quality.

Students are expected to provide updates on their progress each semester, both written and oral. A progress report is required to record a satisfactory progress grade for thesis credits. It is expected that, at a minimum, one peer-reviewed paper will be submitted as part of the thesis option. At a minimum, one presentation or poster at a conference is also expected.

#### The Practice-Oriented Project

The practice-oriented project applies concepts and methodologies to the solution of a practical engineering problem. The project may be job related but must not reproduce significantly a job-related product. The project shall have a theoretical or research component and compare more than one option to demonstrate why the project is or is not worth pursuing. The supervisory committee must approve the project topic.

A project defense is to be presented before the supervisory committee at a time and place approved by the committee. A minimum of two weeks prior to the anticipated meeting, the written project report must be delivered to the supervisory committee chair and a faculty reader appointed by the graduate advisor. The time and location of the seminar will be announced to the entire College of Engineering and Computer Science community through email and physical postings one week prior to the scheduled seminar. The graduate advisor determines the format of the seminar. The graduate advisor and the appointed faculty reader determine, in private consultation at the completion of the presentation, whether or not the project and the report are acceptable in scope and quality.

#### Course Load and Satisfactory Progress

A full-time load is defined as a minimum of 9 credits in the fall semester, 9 credits in the spring semester and 6 credits in the summer semester. All international students must be registered as full-time students. No student may take more than 15 credits in a given semester.

An evaluation of progress toward completion of the degree will be conducted at least once per semester. For project-option students, this is a responsibility of the graduate advisor. For thesis-option students, the supervisory committee conducts the review.

A graduate student whose academic performance is deemed unsatisfactory will be denied further registration in the program. Unsatisfactory academic performance is defined as failure to maintain a minimum 3.0 GPA in all FAU graduate program courses at the end of the second term of enrollment, regardless of the number of credits attempted. No graduate credit may be earned for courses completed with "C-," "D+," "D," "D-," "F" or "U" even if grades in other courses bring the average up to a 3.0.

Thesis-option students are reviewed for satisfactory progress on their theses. If at any time the progress toward the student's thesis is found to be unsatisfactory, the supervisory committee reports the concern to the graduate advisor, informs the student in writing as to the nature of the deficiencies and records the committee's concern in the student's file. The student will be given ample opportunity to improve performance and defend the student's position at a meeting with the graduate advisor and academic advisor approximately 60 days after the initial report of concern. If no improvement has been demonstrated, the student's future program, including the continuation of any financial assistance from the Department, will be reevaluated and the student may be denied further registration in the program.

Project-option students are also reviewed for satisfactory progress on their projects. If at any time the progress toward the student's project is found to be unsatisfactory, the graduate advisor reports the concern to the graduate advisor, informs the student in writing as to the nature of the deficiencies, and records the academic advisor's concern in the student's file. The student will be given ample opportunity to improve performance and defend the student's position at a meeting with the graduate advisor and academic advisor approximately 60 days after the initial report of concern. If no improvement has been demonstrated, the student's future program, including the continuation of any financial assistance from the Department, will be reevaluated and the student may be denied further registration in the program.

### Transfer Credits

A maximum of 9 credits of graduate-level work earned at FAU as an undergraduate or while in non-degree status at FAU and a maximum of 6 credits transferred from another regionally or nationally accredited institution may be used to satisfy M.S. in Civil Engineering degree requirements subject to the following restrictions:

1. The student must present a transcript identifying the course in which the student earned a grade of "B" or better, along with a catalog/course description.
2. The course must not have been counted toward any other graduate or undergraduate degree awarded or to be awarded to the student.
3. The course is relevant to the student's approved Plan of Study.

4. No credit earned seven or more years before the degree is awarded may be counted toward the M.S. in Civil Engineering degree program. Credits transferred into or applied to the program are considered as earned in the first semester of enrollment.

#### Division of Engineering Distance Education and Career Services (DEDECS)

DEDECS is designed to deliver courses via the Internet using video streaming and podcast formats. Degree-seeking students completing courses through DEDECS must follow all degree requirements and regulations. The only exception is that 15 credits of courses taken at other partnering institutions in Florida may be transferred into the M.S. in Civil Engineering program. Program concentration courses may be satisfied with courses from other partnering institutions provided they are substantially equivalent to the Department courses. Equivalency is determined by the graduate advisor. Distance-delivered courses from non-partnering institutions are subject to the normal 6-credit transfer limit and are included in the 15-credit DEDECS transfer limit.

DEDECS students are required to meet the requirements of all other graduate students in the Department. All DEDECS students are required to select a committee chair, committee and a thesis or project that demonstrates understanding and ability to research and apply engineering principles in a manner similar to non-DEDECS students. This includes periodic on-campus presentations and conveyance of work products to demonstrate that the student is making progress.

#### Undergraduate Background Courses for Students Without Baccalaureate Degrees in Engineering

The Civil Engineering faculty welcomes students from other disciplines to the M.S. program. In order to ensure that all students are prepared for graduate work in civil engineering, the Department may require the completion of certain undergraduate background courses. This set is determined by the graduate advisor or the supervisory committee depending on the option selected and will vary according to the student's needs and background. The following list provides guidance. Equivalent courses may be completed at other institutions with the permission of the graduate advisor and/or supervisory committee. The set of required undergraduate courses must be completed before any graduate courses are attempted.

##### Mathematics (15 credits)

1. A full calculus sequence, including MAC 2311 (4), MAC 2312 (4) and MAC 2313 (4).

2. Ordinary differential equations, MAP 2302 (3).

##### Basic Sciences (11 credits)

1. One semester of general chemistry and laboratory, CHM 2045 (3) and CHM 2045L (1).

2. Two semesters of calculus-based physics, PHY 2043 (3), PHY 2044 (3) and one physics laboratory, PHY 2048L (1).

### Engineering (21 credits)

1. A mechanics sequence (9 credits) consisting of Statics, EGN 3311 (3); Dynamics, EGN 3321 (3); and Strength of Materials, EGN 3331 (3).
2. A civil engineering sequence (12 credits) consisting of a coherent set of courses in water resources engineering, environmental engineering, geotechnical engineering and/or structural engineering suited to the student's program of study.
3. At least two engineering laboratory courses are included in the undergraduate civil engineering courses.

### Computer Programming (3 credits)

1. A course in computer programming using any modern programming language.

### Professional Licensing

Engineering is a regulated profession, and many civil engineers become licensed Professional Engineers (P.E.) through a process of examination and certification of engineering experience. Since undergraduate experience and training varies considerably among graduate students, students should contact the Florida Board of Professional Engineers for specific information about eligibility to sit for the licensing examinations. Note completion of the M.S. may not be sufficient to qualify students from non-engineering backgrounds for licensure. Where there are questions, students are asked to contact the Board directly. The Board's address is:

Florida Board of Professional Engineers  
2507 Callaway Road, Suite 200  
Tallahassee, Florida 32303-5268  
850-521-0500 (Telephone)  
850-521-0521 (Fax)  
[www.fbpe.org/](http://www.fbpe.org/)

### Financial Aid

Full-time students may be considered for a graduate assistantship, which provides part-time employment in the Department. Full or partial tuition waivers may also be awarded to graduate assistants. The number of assistantships is limited, and they are awarded on the basis of the technical area of interest, the student's experience and academic record and letters of recommendation. Interested students should contact the graduate advisor.

Graduate research assistants work on research projects conducted in the Department, are required to pursue one of the thesis options, and their project work usually serves as the basis for their theses. Graduate teaching assistants are assigned to assist faculty members with conducting one or more courses and may pursue either the thesis option or project option.

Cooperative education and internship programs are available, providing part-time employment in

engineering firms. Contact the Office of Engineering Career Development, 561-297-2694, for more information.

Other financial aid opportunities may be available through the University. Contact the FAU Student Financial Aid Office for more information.

## **Geomatics Engineering**

The program of study leading to the Bachelor of Science in Geomatics Engineering (B.S.G.E.) deals with designing solutions to measure, map, model, analyze, and graphically display the real world. Graduates will explore cutting edge technology in image processing, digital photogrammetry, remote sensing, satellite-based global positioning, geographic information systems, laser scanning, and digital mapping. Students complete coursework in basic science and mathematics, engineering sciences and the main disciplines in geomatics engineering. Because of the major impact geomatics engineers have on society, the curriculum also requires students to pursue studies in the social sciences and the humanities.

### **Geomatics Engineering Vision and Mission**

The Geomatics Engineering program delivers a quality educational experience in surveying, mapping and emerging geomatics technologies throughout the FAU service area and beyond and makes a significant contribution to the needs of a growing South Florida community. Program faculty focuses on student-centered learning methodologies that transform students into active learners, motivated to serve society.

This program values ethical behavior, critical thinking, innovation, individual responsibility, thoughtful risk taking, teamwork and leadership.

### **Geomatics Engineering Educational Objectives**

Program Educational Objectives are broad statements that describe the expected accomplishments and professional status of Geomatics Engineering graduates a few years beyond the baccalaureate degree.

The Geomatics Engineering Program at Florida Atlantic University is designed for the following:

1. **Preparation for Practice:** Graduates will be prepared for entry-level positions in geomatics engineering, for attainment of professional licensure, and for graduate/professional studies.
2. **Tools for Creativity:** Graduates will experience the creative and design processes and their application to typical geomatics engineering situations.
3. **Societal Awareness:** Graduates will receive the breadth of education necessary to integrate geomatics engineering practice with the needs and interests of a diverse modern society.

4. **Leadership Skills:** Graduates will be prepared for future leadership in the geomatics engineering profession.

[Link to Geomatics Engineering Minor](#)

[Link to Certificate in Geomatics Engineering](#)

Bachelor of Science in Geomatics Engineering

**Admission Requirements**

All students must meet the minimum admission requirements of the University. Please refer to the [Admissions section](#) of this catalog.

All students must meet the pre-professional requirements listed above in order to be accepted into the Geomatics Engineering program.

**Pre-requisite Coursework for Transfer Students**

Students transferring to Florida Atlantic University must complete both lower-division requirements (including the requirements of the Intellectual Foundations Program) and requirements for the college and major. Lower-division requirements may be completed through the A.A. degree from any Florida public college, university or community college or through equivalent coursework at another regionally accredited institution. Before transferring and to ensure timely progress toward the baccalaureate degree, students must also complete the pre-requisite courses for their major as outlined in the *Transfer Student Manual* (see [www.fau.edu/registrar/tsm.php](http://www.fau.edu/registrar/tsm.php)).

All courses not approved by the Florida Statewide Course Numbering System that will be used to satisfy requirements will be evaluated individually on the basis of content and will require a catalog course description and a copy of the syllabus for assessment.

**Coursework for Transfer Students**

In order to minimize the time necessary to complete the Geomatics Engineering degree, transfer students entering the University with an A.A. degree should structure their programs to include the following:

Topics	Credits (1)	
English Composition	6	(two 3-credit courses)
Social Science	6	(two 3-credit courses)
Humanities	6	(two 3-credit courses)
Public Speaking	3	(one 3-credit course)
Complete Calculus Sequence	12	(three 4-credit courses)
Differential Equations	3	(one 3-credit course)
General Chemistry, with Lab	4	(one 4-credit course,

		including lab)
Engineering Physics, with Labs	8	(two 4-credit courses, including labs)
Fundamentals of/Introduction to Engineering (2)	3	(one 3-credit course)

Notes:

(1) The number of credits may vary by institution.

(2) An introductory course in engineering is preferred. However, substitutions may be allowed, provided they are part of a cohesive pre-engineering A.A. degree program.

### Degree Requirements

The Bachelor of Science in Geomatics Engineering degree will be awarded to students who:

1. Meet all general degree requirements of the University;
2. Complete the curriculum for the B.S.G.E. in Geomatics Engineering degree (see below);
3. Take the National Council of Examiners for Engineering and Surveying (NCEES) Fundamentals of Surveying Examination (the first of two exams necessary for professional surveyors and mappers license). Contact Geomatics Engineering for details.

### Curriculum

The Bachelor of Science in Geomatics Engineering degree requires 120 credits. For credit toward the degree, a grade of "C" or better must be received in each course listed, except for humanities and social science courses not applied toward Writing Across Curriculum (Gordon Rule) writing requirements. In addition, all prerequisites for each mathematics, science or engineering course must be completed with a grade of "C" or better before enrollment is permitted. The degree components are listed below.

General Studies		
College Writing 1 (1),(2)	ENC 1101	3
College Writing 2 (1),(2)	ENC 1102	3
Public Speaking	SPC 2601	3
Intellectual Foundations Program Societal and Human Behavior Courses (1),(3)		6
Intellectual Foundations Program Global Citizenship Courses (1), (3)		6
Intellectual Foundations Program Creative Expression Courses (1),(3)		6
Total		27

Basic Mathematics and Sciences		
Calculus for Engineers 1 (1),(4)	MAC 2281	4
Calculus for Engineers 2 (1),(4)	MAC 2282	4
Calculus with Analytic Geometry 3	MAC 2313	4
Engineering Math 1	MAP 3305	3
Probability and Statistics for Engineers	STA 4032	3
Engineering Chemistry (1)	EGN 2095	3
Engineering Chemistry Lab (1)	EGN 2095L	1
Physics for Engineers 1 (1),(5)	PHY 2043	3
General Physics 1 Lab	PHY 2048L	1
Physics for Engineers 2 (1),(5)	PHY 2044	3
General Physics 2 Lab	PHY 2049L	1
Total		30

Engineering Fundamentals		
Fundamentals of Engineering	EGN 1002	3
Introduction to Geomatics Engineering	SUR 2034	3
Total		6

Professional Core (6)		
Plane Surveying	SUR 2101	3
Plane Surveying Lab	SUR 2101L	1
Introduction to Mapping and GIS (7)	GIS 3015C	3
Surveying Data Analysis	SUR 3643	3
Photogrammetry (8)	SUR 3331	2
Photogrammetry Lab (8)	SUR 3331L	1
Automated Surveying and Mapping	SUR 3141	3
Automated Surveying and Mapping Lab	SUR 3141L	1
Principles of Geographic Information Systems (7)	GIS 4043C	3
Introduction to Geodesy	SUR 3530	3
Engineering and Construction Surveying	SUR 3205	3
Engineering and Construction Surveying Lab	SUR 3205L	1
Land Subdivision and Platting	SUR 3463	2



Land Subdivision and Platting Lab	SUR 3463L	1
Geomatics Engineering Design 1	SUR 4670	3
Remote Sensing of the Environment (7)	GIS 4035C	3
Legal Aspects of Surveying	SUR 4403	3
Positioning with GPS	SUR 4531	2
Positioning with GPS Lab	SUR 4531L	1
Engineering Economics	EGN 4613	3
Geomatics Engineering Design 2	SUR 4672	3
Hydrographic Surveying w/ Lab	SUR 4302/ SUR4302L	3
Professional Electives (select 2) (9)		6
<b>Total</b>		<b>57</b>

Notes:

- (1) Contributes to University Core Curriculum requirements.
- (2) Contributes to Writing Across Curriculum (Gordon Rule) writing requirement.
- (3) Intellectual Foundation Program courses, totaling 6 or more credits, must be selected to satisfy Writing Across Curriculum (Gordon Rule) writing requirements.
- (4) Contributes to Gordon Rule mathematics requirement.
- (5) PHY 2048 and PHY 2049 (4 credits each) are acceptable substitutes, but only 6 credits will apply toward the degree.
- (6) All professional core courses contain a communications component (writing or speaking).
- (7) Includes a 1-credit laboratory.
- (8) GIS 4023 is an acceptable substitute.
- (9) See advisor for the list of approved professional electives.

Sample Four-Year Program of Study for Bachelor of Science in Geomatics Engineering

First Year, Fall (14 credits)		
College Writing 1	ENC 1101	3
Engineering Chemistry (1)	EGN 2095	3
Engineering Chemistry Lab (1)	EGN 2095L	1

Calculus for Engineers 1	MAC 2281	4
Fundamentals of Engineering	EGN 1002	3

First Year, Spring (14 credits)		
College Writing 2	ENC 1102	3
Physics for Engineers 1	PHY 2043	3
General Physics 1 Lab	PHY 2048L	1
Calculus for Engineers 2	MAC 2282	4
Intellectual Foundations Program Course		3

Second Year, Fall (14 credits)		
Physics for Engineers 2	PHY 2044	3
General Physics 2 Lab	PHY 2049L	1
Calculus with Analytic Geometry 3	MAC 2313	4
Introduction to Geomatics Engineering	SUR 2034	3
Intellectual Foundations Program Course		3

Second Year, Spring (16 credits)		
Introduction to Mapping and GIS	GIS 3015C	3
Engineering Mathematics 1	MAP 3305	3
Plane Surveying	SUR 2101	3
Plane Surveying Lab	SUR 2101L	1
Public Speaking	SPC 2608	3
Intellectual Foundations Program Course		3

Third Year, Fall (16 credits)		
Surveying Data Analysis	SUR 3643	3
Photogrammetry	SUR 3331	2
Photogrammetry Lab	SUR 3331L	1
Automated Surveying and Mapping	SUR 3141	3
Automated Surveying and Mapping Lab	SUR 3141L	1
Probability and Statistics for Engineers	STA 4032	3
Intellectual Foundations Program Course		3

Third Year, Spring (16 credits)		
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Principles of Geographic Information Systems	GIS 4043C	3
Introduction to Geodesy	SUR 3530	3
Engineering and Construction Surveying	SUR 3205	3
Engineering and Construction Surveying Lab	SUR 3205L	1
Land Subdivision and Platting	SUR 3463	2
Land Subdivision and Platting Lab	SUR 3463L	1
Intellectual Foundations Program Course		3

Fourth Year, Fall (15 credits)		
Geomatics Engineering Design 1	SUR 4670	3
Remote Sensing of the Environment	GIS 4035C	3
Legal Aspects of Surveying	SUR 4403	3
Positioning with GPS	SUR 4531	2
Positioning with GPS Lab	SUR 4531L	1
Engineering Economics	EGN 4613	3

Fourth Year, Spring (15 credits)		
Geomatics Engineering Design 2	SUR 4672	3
Hydrographic Surveying w/ Lab	SUR 4302/ SUR4302L	3
Professional Electives (select 2)		6
Intellectual Foundations Program Course		3

Minors and Certificate Programs Appropriate for Geomatics Engineering  
 Geomatics engineering encompasses many disciplines. For example, it is not uncommon for an individual to be licensed as both a professional engineer and a professional surveyor. Various departments offer minors and certificate programs that augment a student's geomatics engineering education. Students are encouraged to pursue a minor or certificate, such as:

- Geographic Information Systems Certificate** (Department of Geosciences)
- Geography** (Department of Geosciences)
- Geology** (Department of Geosciences)

Obtaining a minor or certificate will require completing credits beyond the 120 required for the B.S.G.E. in Geomatics Engineering. Contact the department offering the minor or certificate for more details.

### Cooperative Education

Geomatics Engineering majors are strongly encouraged to gain practical experience through participation in Cooperative Education. For information, contact the Office of Engineering Career Development at 561-297-2694.

### Geomatics Engineering Minor

Students minoring in Geomatics Engineering will complete a minimum of 19 credits with a grade of "C" or better in each course. Of the 19 credits, a minimum of 15 must be earned at FAU. Selected courses must be checked for the proper requirements. The minor is available to all full-time FAU students pursuing a declared major.

Required Courses (7 credits) (to be taken first)		
Introduction to Geomatics Engineering (1)	SUR 2034	3
Plane Surveying (2)	SUR 2101	3
Plane Surveying Lab (2)	SUR 2101L	1

Select additional courses from below for a minimum of 12 credits		
Photogrammetry (3)	SUR 3331	2
Photogrammetry Lab (3)	SUR 3331L	1
Surveying Data Analysis (3)	SUR 3643	3
Automated Surveying and Mapping (3)	SUR 3141	3
Automated Surveying and Mapping Lab (3)	SUR 3141L	1
Land Subdivision and Platting (4)	SUR 3463	2
Land Subdivision and Platting Lab (4)	SUR 3463L	1
Engineering and Construction Surveying (4)	SUR 3205	3
Engineering and Construction Surveying Lab (4)	SUR 3205L	1
Introduction to Geodesy (4)	SUR 3530	3
Positioning with GPS (5)	SUR 4531	2
Positioning with GPS Lab (5)	SUR 4531L	1

Legal Aspects of Surveying (6)	SUR 4403	3
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Notes:

- (1) SUR 2104C, Fundamentals of Surveying, may be substituted.
- (2) Requires knowledge of geometry and trigonometry.
- (3) Requires SUR 2101/SUR 2101L, Plane Surveying/Plane Surveying Lab, as prerequisites.
- (4) Requires SUR 3643, Surveying Data Analysis, as a prerequisite.
- (5) Requires SUR 3530, Introduction to Geodesy, as a prerequisite.
- (6) Requires SUR 3463/SUR 3463L, Land Subdivision and Platting/Land Subdivision and Platting Lab, as prerequisites.

### Geomatics Engineering Certificate

The Geomatics Engineering program offers undergraduates a certificate in Geomatics Engineering. Students are entitled to the certificate by completing a minimum of 13 credits of coursework with a grade of "C" or better. Selected courses must be checked for the proper prerequisites. The certificate is open to both degree-seeking and non-degree-seeking students.

Required Courses (7 credits) (to be taken first)		
Introduction to Geomatics Engineering (1)	SUR 2034	3
Plane Surveying (2)	SUR 2101	3
Plane Surveying Lab (2)	SUR 2101L	1

Select additional courses from below for a minimum of 6 credits		
Photogrammetry (3)	SUR 3331	2
Photogrammetry Lab (3)	SUR 3331L	1
Automated Surveying and Mapping (3)	SUR 3141	3
Automated Surveying and Mapping Lab (3)	SUR 3141L	1
Land Subdivision and Platting (4)	SUR 3463	2
Land Subdivision and Platting Lab (4)	SUR 3463L	1
Legal Aspects of Surveying (5)	SUR 4403	3

Notes:

- (1) SUR 2104C, Fundamentals of Surveying, may be substituted.
- (2) Requires knowledge of geometry and trigonometry.

(3) Requires SUR 2101/SUR 2101L, Plane Surveying/Plane Surveying Lab, as prerequisites.

(4) Requires SUR 3643, Surveying Data Analysis, as a prerequisite.

(5) Requires SUR 3463/SUR 3463L, Land Subdivision and Platting/Land Subdivision and Platting Lab, as prerequisites.