COLLEGE OF ENGINEERING
Changes to Note

The follow curricular changes for the College of Engineering were approved by the USF Graduate Council on the date noted. *Program Terminations were approved as noted, but may still be active at the State level pending final termination from the Degree Inventory.

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University of South Florida  
College of Engineering  
4202 E. Fowler Ave ENB118  
Tampa, FL 33620

Web address:  http://www2.eng.usf.edu/

Phone:  813-974-3780  
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College Dean:  Robert H. Bishop, Ph.D.  
Associate Dean:  Rafael Perez, Ph.D.

Accreditation:  
The Commission on Colleges of the Southern Association of College and Schools. Contact College for additional accreditation information.

MISSION STATEMENT
The mission of the USF College of Engineering is to improve the quality of life in our community by providing a high quality education for our engineering graduates and practicing professionals; by creating new knowledge and solving real world problems via innovative research; and by engaging in effective community service and outreach.

WHAT WE DO
At the graduate level students work in close collaboration with faculty, pursuing advanced topics within their disciplines, which will result in advancements in their fields and society at large.

Utilizing the expertise of its individual and collective faculty, the College is dedicated to the development of new fundamental knowledge and processes or procedures, which will benefit all humanity. The College promotes multi-disciplinary approaches, commitment to life-long learning and awareness of societal issues, which are requisite for meeting technological challenges.

The College provides technical assistance and technology transfer to the region, state and nation. In all facets of teaching, research and service, the College emphasizes close liaisons with industry and government to provide students and faculty with the skills and perspectives needed to ensure effective technological leadership.
Degrees, Programs, Concentrations:
See individual listings for current active status

Degree
Program
Concentration

Master of Civil Engineering (M.C.E.)
Civil Engineering (ECE)
Geotechnical (GTL)
Materials (MTL)
Structures (STR)
Transportation (TPT)
Water Resources (WRS)

Master of Environmental Engineering (M.E.V.E.)
Environmental Engineering (EVE)

Master of Mechanical Engineering (M.M.E.)
Mechanical Engineering (EME)

Master of Science in Biomedical Engineering (M.S.B.E.)
Biomedical Engineering (EBI)
Pharmacy (PRMY)

Master of Science in Chemical Engineering (M.S.C.H.)
Chemical Engineering (ECH)
Biomedical & Biotechnology (BEB)

Master of Science in Civil Engineering (M.S.C.E.)
Civil Engineering (ECE)
Engineering for International Development (EFD)
Geotechnical (GTL)
Materials (MTL)
Structures (STR)
Transportation (TPT)
Water Resources (WRS)

Master of Science in Computer Engineering (M.S.C.P.)
Computer Engineering (ECP)

Master of Science in Computer Science (M.S.C.S.)
Computer Science (ECC)

Master of Science in Electrical Engineering (M.S.E.E.)
Electrical Engineering (EEL)

Master of Science in Engineering Management (M.S.E.M.)
Engineering Management (EMA)
Master of Science in Engineering Science (M.S.E.S.)
   Engineering Science (EGC)
   Chemical and Biomedical Engineering (CHB)
   Electrical Engineering (PEE)
   Environmental Engineering (EVE)
   Transportation Engineering (TPE)

Master of Science in Environmental Engineering (M.S.E.V.)
   Environmental Engineering (EVE)
   Engineering for International Development (EFD)

Master of Science in Industrial Engineering (M.S.I.E.)
   Industrial Engineering (EIE)

Master of Science in Information Technology (M.S.I.T.)
   Information Technology (ITC)

Master of Science in Materials Science and Engineering (M.S.M.S.E.)
   Materials Science and Engineering (MSE)

Master of Science in Mechanical Engineering (M.S.M.E.)
   Mechanical Engineering (EME)

Doctor of Philosophy (Ph.D.)
   Biomedical Engineering (EBI)
   Chemical Engineering (ECH)
      Biomedical & Biotechnology (BEB)
      Manufacturing (MFT)
   Civil Engineering
      Environmental Engineering (ENV)
      Geotechnical (GTL)
      Materials (MTL)
      Structures (STR)
      Transportation (TPT)
      Water Resources (WRS)
   Computer Science and Engineering (CSE)
   Electrical Engineering (EEL)
   Engineering Science (EGC)
   Environmental Engineering (EVE)
   Industrial Engineering (EIE)
   Mechanical Engineering (EGR)
      Manufacturing (MFG)

Accelerated Degree Programs
   BS/M.E. or BS/M.S. – Engineering

Dual Degree Programs:
   Dual Degrees in Biomedical Engineering (Ph.D.) and Medicine (M.D.)
   Dual degrees in Biomedical Engineering (M.S.B.E.) and Entrepreneurship in Applied Technologies (M.S.)

Graduate Certificates Offered:
   See Graduate Certificates
COLLEGE REQUIREMENTS

General Program Requirements
The requirements for graduate degrees from the College of Engineering consist of University requirements, College requirements, and Program requirements. For University requirements refer to the Office of Graduate Studies Policies and Procedures. College requirements are listed below. Refer to the degree program sections for other requirements.

Master’s Degree Programs
The Master’s degree is awarded for advanced study beyond the baccalaureate degree within an area of specialty. The College of Engineering offers several programs leading to degrees at the master’s level.

Master of Science in Designated Engineering Field - This degree is normally awarded to a Master’s graduate who holds a Bachelor’s degree in the designated field. Some programs offer this degree in two options: (1) thesis option (30 credits), and (2) non-thesis option (30 credits).

Master of Science in Engineering Science - This program is designed to meet the needs of students who wish to pursue an interdisciplinary course of study and research. This degree is individually tailored to student needs. Some programs offer this degree in two options: (1) thesis option (30 credits), and (2) non-thesis option (30 credits).

Master of Designated Discipline - This degree is normally awarded to a Master’s graduate who has an undergraduate degree in the discipline and who follows an all coursework program or a project program.

College of Engineering Requirements for Master’s Degree
1. A thesis program must contain a minimum of 24 credit hours of coursework and a minimum of 6 credit hours of thesis. (If a student transfers from a thesis program to an all coursework program, no thesis hours may be transferred, converted or counted toward the degree.)
2. Non-thesis program requirements vary according to department but must contain a minimum of 30 credits of approved coursework.
3. Students must maintain an overall grade point average of 3.00. No grade below “C” will be accepted in a graduate program. If a student’s average falls below 3.00, the student will be placed on probation.
4. Most programs require students to pass a final oral or written comprehensive examination prior to receiving the degree. These examinations are arranged and administered by the student’s department.

Accelerated Programs Leading to Accelerated Bachelor’s and Master’s Degrees
Students who are clearly interested in graduate study are invited to pursue an accelerated program leading to a Bachelor’s Degree and Master’s degree in the College of Engineering. Students in the Accelerated Program may apply up to 12 credit hours of coursework, which must be approved by the Graduate Program Coordinator, to count towards both degrees.

Students apply for admission to this program through their advisors, who should be consulted regarding additional requirements. Several factors, which vary by academic department, are considered for admission. However, all applicants must have a minimum GPA of at least 3.00.

Doctoral Degree Programs
The Doctor of Philosophy degree is awarded in recognition of demonstrated scholarly competence and ability to conduct and report original and significant research. Unlike the baccalaureate and Master’s degrees, the Ph.D. degree cannot be earned by an accumulation of course credits over a period of residence alone. After adequate fundamental preparation to gain competence, the student must demonstrate research capability through completion of an authoritative investigation in the chosen
engineering field, culminating in a written dissertation. The dissertation must demonstrate that the student possesses the ability to reason logically, the talent for engaging in significant and original research, and the ability to organize and present conclusions in a professional manner.

Doctor of Philosophy in Designated Engineering Field - This degree is awarded to students pursuing a program in one of the following Engineering disciplines: Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Science and Engineering, Electrical Engineering, Environmental Engineering, Industrial Engineering, and Mechanical Engineering. Students receiving this degree must demonstrate a thorough foundation in the designated discipline.

Doctor of Philosophy in Engineering Science - This program is designed to meet the needs of students who wish to pursue doctoral studies in interdisciplinary areas closely related to engineering.

College of Engineering Requirements for Doctoral Degrees

1. **Supervisory Committee.** An advisor will be appointed by the chair of the appropriate department or program for each student during the first semester of registration at the University of South Florida. The advisor will help determine the student’s area of research interest and will delineate preliminary course assignments. At the earliest possible date, a major professor will be appointed and a supervisory committee formed. This committee will monitor the student's program of studies and has full responsibility for conducting the student’s qualifying examination. The Supervisory Committee consists of a minimum of five members. One member of the committee must be outside the College of Engineering. (The requirement may be waived if special reasons exist and prior approval is obtained from the Engineering Associate Dean for Academic Affairs.) A majority of the committee will be from the College of Engineering, with at least two departments of the College represented.

2. **Credit Hours.** A minimum of 72 hours beyond the baccalaureate degree, including a minimum of 20 hours of dissertation, and a minimum of 30 hours of coursework (excluding independent study and directed research) is required by the College. Further requirements may be imposed by the candidate’s doctoral program and supervisory committee. See individual programs for specific requirements.

3. **Learning Focus.** Throughout the student’s program of study, independent learning will be emphasized. For the first time in the participant’s career, in most cases, the student will be responsible for mastering a new domain of knowledge without the aid of organized lectures and textbooks. The principal information source will be current literature. Such experience is a necessary preparation for a meaningful career in engineering and other fields where the professional must keep pace with a large, ever-changing body of knowledge.

4. **Qualifying Examination.** A written and oral qualifying examination, conducted by the supervisory committee, will be taken by each Ph.D. student as soon as a substantial majority of coursework is completed.

5. **Admission to Candidacy.** Students must be admitted to candidacy before they register for dissertation. Before admission to candidacy, students must have officially formed a Ph.D. Supervisory Committee and passed the qualifying examination of paragraph 4. Once admitted to candidacy students must enroll for a minimum of 2 credit hours each semester of the academic year until completion of program.

6. **Dissertation Research.** The student must carry out an investigation resulting in an original and significant contribution to the knowledge in the field of research. The requirement of uniqueness
means that the dissertation research will provide an important creative experience for the student. As the final stage of the student’s program, the candidate must prepare a written dissertation covering the research. Students in the Ph.D. program must take an appropriate number of doctoral dissertation credits, but not less than 20 hours; the exact number is determined by department and/or individual requirements. The defense of the dissertation will conform to Office of Graduate Studies general rules.

7. **Residency.** Minimum residency requirements may be satisfied by completing the University’s minimal requirement at the University of South Florida. Any graduate work counted toward the fulfillment of the requirement for the Ph.D. degree after admission to candidacy must be accomplished within 5 calendar years.

**Collaboration with Other Colleges and Departments**
Advanced study and research challenges exist at the interfaces between engineering and other academic disciplines. Examples include surface physics and chemistry applied to semiconductor processing technology; semiconductor physics applied to VLSI and analog integrated circuit design, manufacture and quality control; chemical processing and its relation to chemical principles; environmental engineering and chemical identification of minute impurities; environmental and transportation engineering and its relation to public health and public administration; water resources engineering and geo-hydrology; and biomedical engineering, to name only a few. The College collaborates with other academic units of the University in research activities and selectively educates students to become proficient in such interdisciplinary fields.
About the Catalog

The University of South Florida Graduate Catalog is organized with the degree programs offered listed in the section of the College that offers them. For example, the Master of Science degree with a “program” (also known as major) in Biology is listed in the College of Arts and Sciences section. Some colleges offer areas of specialization, or “concentrations” within a degree program.

PROGRAMS

CIVIL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

CONCENTRATIONS

Concentration Requirements are listed separately under each Program.

The Program and Concentration are listed on the official transcript. Other areas, such as application tracks, are not listed on the transcript.

Example:
Doctor of Philosophy in Civil Engineering with a Concentration in Transportation
BIOMEDICAL ENGINEERING PROGRAM

Master of Science in Biomedical Engineering (M.S.B.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15 (Sept 15 – Int’l)
- Summer: February 15 (Jan 15 – Int’l)

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.0501
Dept. Code: DEA
Program (Major/College): EBI EN
Approved: 1999

CONTACT INFORMATION

College: Engineering
Department: Chemical & Biomedical Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

Biomedical Engineering is a highly interdisciplinary program that combines engineering and the medical sciences. The student works with an advisor to develop a graduate program that draws on courses from engineering, medicine, public health, and the life sciences. Current active areas of research include: biomechanics, biomaterials, medical imaging, neuroengineering, tissue engineering, sensors, cellular-level drug delivery, and rehabilitation engineering. In addition to USF Health, participating institutions include the James Haley Veterans Administration Hospital, Florida Orthopedics Institute, and Tampa General Hospital. For more information, please contact the BME Program Advisor.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas: Biomechanics, Biomaterials, Neuroengineering, Photo Sensors, Cellular-level drug discovery and Tissue Engineering

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- Undergraduate GPA of 3.00 or higher;
- GRE with preferred Minimum scores of Quantitative >75% and Analytical Writing 4 or >;
- An undergraduate Bachelor’s degree in Engineering or Science;
- TOEFL 550 (paper-based total) for international students or 213 (computer-based total);
- Two (2) letters of recommendation; and
- A statement of purpose
- CV
- Applicants from countries where English is not the official language must demonstrate proficiency in English. See the Admissions Policy section of the Graduate Catalog for approved ways of demonstrating proficiency. http://www.grad.usf.edu/policies_Sect4_full.php
Note: Exceptionally qualified students with bachelor’s degrees in other disciplines may be admitted into the BME M.S. Program on a case-by-case evaluation of their credentials.

DEGREE PROGRAM REQUIREMENTS
Total Minimum Program Hours: 30 credit hours

Both the thesis and non-thesis options are available at the M.S. level.

Core Requirements
Currently there are five (5) required courses:
GMS 6440 (3) Basic Medical Physiology
GMS 6605 (3) Basic Medical Anatomy
PHC 6051 (3) Biostatistics II
BME 6000 (3) Biomedical Engineering I
BME 6931 (3) Biomedical Engineering II

Students may either opt for the General Track of the Concentration in Pharmacy, completing 15 hours as noted:

General Track Electives – 15 hours
Students select from additional approved courses to complete the 30 hour requirement. A minimum of 16 hours must be at the 6000 level. In addition, all of the elective courses must consist of engineering-prefix courses, although the Thesis Committee (thesis option) or the BME Program Advisor (non-thesis option) may approve courses in relevant areas such as chemistry, physics, pharmacy, communications sciences & disorders, public health or medicine, in their place.

Concentration in Pharmacy (PRMY) – 15 hours
Students may select from the following options, or other pharmacy courses, as approved by their Pharmacy and BME Advisors:

PHA 6140 3 Introduction to Nanotechnology (Online)
PHA 6116 3 Micro-Nano Drug Delivery Systems (Online)
PHA 6118 3 Nanomaterials and BioMEMS (Online)
PHA 6xxx 3 Nanotechnology and Risk Management (Online)
PHA 6xxxx 3 Nanoforumlations and nanopharmacutics (Online)
PHA 6xxx 3 Introduction to Personalized medicine (Online)

Thesis Option
Thesis option students can count up to six hours of thesis research towards the elective requirements

Comprehensive Exam
Students in the non-thesis track will complete a comprehensive exam. For students in the thesis track, the thesis and oral defense serve as the comprehensive exam.

COURSES
See http://ugs.usf.edu/course-inventory
BIOMEDICAL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 90
Program Level: Doctoral
CIP Code: 14.0501
Dept. Code: ECH
Program (Major/College): EBI EN
Approved: 2005

CONTACT INFORMATION

College: Engineering
Department: Chemical & Biomedical Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The Ph.D. in Biomedical Engineering at the University of South Florida prepares individuals to contribute in this highly interdisciplinary field both as individuals and as members of interdisciplinary teams. Graduates are prepared to solve complex problems in areas such as diagnostic instrumentation, artificial organs, prosthetic devices, rehabilitation, and health care system design and operations, biomechanics, biomaterials, imaging, neuroengineering, tissue engineering, sensors, cellular-level drug delivery. The doctoral program capitalizes on USF's strong programs in Engineering and in the Health Sciences as well as the contiguously located H. Lee. Moffitt Cancer Center and Research Institute, and the James Haley Veterans Administration Hospital.

Students in the program may choose to concentrate in one of several nationally recognized areas of Biomedical Engineering strength at USF including:

- Medical Imaging
- Rehabilitation Engineering
- Biomechanics and Biomaterials
- Molecular, Cellular and Tissue Engineering
- Drug and Gene Delivery
- Neuroengineering
- Photonics and Diagnostic Engineering

The Biomedical Engineering Program at USF provides students with an integrated knowledge of engineering, biomedical science and other appropriate disciplines to allow participation in and advancement of the interdisciplinary field of Biomedical Engineering. The program also facilitates biomedical engineering research at USF through interactions with USF faculty and with industry and other health care institutions and catalyzes the growth of biomedical product companies throughout the region by the development, dissemination, and commercialization of new biomedical technologies. Overall, the program strives to develop and promote technologies and processes that will lead to better health care and improved quality of life.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas: Neuroengineering, biomechanics, biomaterials, medical imaging, sensors, cellular-level drug delivery, and rehabilitation engineering and tissue engineering

http://www.eng.usf.edu/
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
Successful applicants to the Ph.D. degree program in biomedical engineering will typically have presented the following preferred qualifications:

- GRE required with preferred scores: Verbal >50% percentile and Quantitative > 75th percentile and Analytical Writing > 4.0.
- An undergraduate GPA of >3.5 (out of a possible 4.0) based on official transcripts.
- Completion of a Master's degree in biomedical engineering or a related field.
- Evidence of sustained interest in biomedical engineering.
- A statement of purpose and CV.
- Three (3) Letters of recommendation.

Note: Admissions decisions will be made using multiple measures indicated above. We strongly encourage applicants to contact specific faculty conducting research related to the student’s interests. Such direct contact with individual faculty members can greatly strengthen an application.

DEGREE PROGRAM REQUIREMENTS

Total Minimum Hours: 90 hours

1) Core Courses:
A minimum of 15 credits including:
- GMS 6440 Basic Medical Physiology 3
- GMS 6605 Basic Medical Anatomy 3
- PHC 6051 Biostatistics II 3
- BME 6000 Biomedical Engineering I 3
- BME 6931 Biomedical Engineering II 3

2) Specialization Courses:
A minimum of 12 credit hours selected from one of these areas of specialization:
- Medical Imaging
- Rehabilitation Engineering
- Biomechanics and Biomaterials
- Cardiovascular Engineering
- Neuroengineering
- Tissue Engineering

Courses completed as part of a Master’s degree may be used to partially meet the above course requirements.

3) Dissertation:
A minimum of 30 credits of dissertation research are required. As with other engineering Ph.D. degrees, evidence of the significance of the conducted research is provided by publication in appropriate refereed journals.

OTHER INFORMATION

Graduate Assistantships and Fellowships
Financially competitive teaching and research graduate assistantships and fellowships will be offered to incoming students. Of special importance are the research opportunities and support available through affiliated institutions including the H. Lee Moffitt Cancer Center and Research Institute, the James Haley VA Hospital. In addition, particularly outstanding applicants will be nominated for university fellowships including Presidential Fellowships which provide competitive stipends plus tuition, fees and Health Insurance renewable for five years.
Results
Doctoral graduates of this program have been prepared for and are successfully engaged in research careers in Government, Corporate, and University Laboratories. In addition, since much of Biomedical Engineering research translates directly into biomedical devices, drugs, and instrumentation, graduates have also been directly involved in technology transfer, including the establishment of new Biomedical Engineering related businesses.

Graduate Certificates
As a valuable complement to graduate training in Biomedical Engineering, students are encouraged to also consider earning a graduate certificate particularly in the areas of:

- Aging and Neuroscience
- Biochemistry and Molecular Biology
- Bioinformatics
- Biostatistics
- Biotechnology
- Clinical Epidemiology
- Entrepreneurship
- Health Management and Leadership
- Infection Control
- Materials Science & Engineering
- Regulatory Affairs – Medical Devices.
- Technology Management
- Total Quality Management

COURSES
See http://ugs.usf.edu/course-inventory
BIOMEDICAL ENGINEERING AND ENTREPRENEURSHIP IN APPLIED TECHNOLOGIES DUAL DEGREE PROGRAM

Master of Science in Biomedical Engineering (M.S.B.E.) Degree and Master of Science (M.S.)

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30

Program Levels: Masters

CIP Code: 14.0501 / 52.0701

Dept. Codes: ECH / DEA

Program (Major/College): EBI EN / EAT GS

CONTACT INFORMATION

Colleges: Engineering and Graduate Studies
Department: Chemical & Biomedical Engineering
Entrepreneurship

Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The M.S. Biomedical Engineering (BME) and M.S. Entrepreneurship In Applied Technologies (EAT) Dual Degree Program is designed to prepare students who can effectively function in the complex world of Biotechnology companies (“Biotechs”). The program’s objectives are to provide a strong BME foundation for technical product development and research and development along with the skill set to effectively participate in the entrepreneurship, venture capital, business and financial aspects of Biotechs. Students would pursue appropriate coursework within both the College of Engineering and the Center For Entrepreneurship, double counting a total of nine credit hours.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements for each program. Students must satisfy the requirements for the two degrees separately. Refer to the individual program listings for the specific requirements for each degree.

DEGREE PROGRAM REQUIREMENTS

Course requirements:

Biomedical Engineering
BME 6000 Biomedical Engineering I 3
BME 6931 Biomedical Engineering II 3
GMS 6440 Basic Medical Physiology 3
GMS 6605 Basic Medical Anatomy 3
PHC 6051 Biostatistics II 3
Additional approved BME courses 12
(can include up to 6 thesis hours for thesis option)
Common BME/EAT courses 9

30 hours required

30 hours total
**Common Courses** (counted towards both the BME and EAT degrees)  
BME 6000 Biomedical Engineering 3  
GMS 7930 Principles of Intellectual Property 3  
EIN 6391 New Product Development 3  

**Entrepreneurship in Applied Technologies**  
EIN 6324 Technical Entrepreneurship 3  
EIN 6935 Technology Venture Strategies 3  
EIN 6935 Strategic Marketing Assessments 3  
EIN 6934 Venture Cap Private Equity 3  
GMS 7930 Medical Ethics and Humanities 2  
EIN 6430 Overview of Regulated Industries 3  
MAN 6930 Entrepreneurship Research Seminar 1  
EIN 6936 Strategies in Entrep Technology 3  
Common BME/EAT courses 9  

9 hrs total  
30 hours required

**COURSES**  
See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
BIOMEDICAL ENGINEERING AND MEDICINE
DUAL DEGREE PROGRAM

Doctor of Philosophy (Ph.D.) Degree in Biomedical Engineering and
Doctor of Medicine (M.D.) Degree in Medicine

DEGREE INFORMATION
Program Admission Deadlines:
   Fall: November 1
   Spring: No Admit
   Summer: No Admit
Minimum Total Hours: 90/
Program Level: Doctoral/Professional
CIP Code: 14.0501
Dept. Code: ECH
Program (Major/College): EBI EN

CONTACT INFORMATION
Colleges: Engineering/Medicine
Departments: Chemical & Biomedical Engineering; Medicine
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION
The Objectives of the M.D./Ph.D. Program are: 1) Produce Highly Trained Professionals who can work effective in the area of Biomedical Translational Research, more specifically Engineer-Physicians who can conduct research in a Biomedical Engineering Area that addresses a significant clinical problem, and bring that research through to Clinical application; and 2) provide an integrated educational experience leading to both the M.D. degree and the Ph.D.(BME) Degree. In order to accomplish the first objective, advances in health care increasingly involves the application of emerging science and technology (i.e., Engineering) to clinical problems, including problems in diagnostics treatment and the health care system itself. Unlike more basic research that often aims to increase science and technology knowledge in itself, translational research seeks to specifically address the science and technology needed to solve problems with the end product an actual application or product (of course, adding new significant knowledge in the process).

In order to conduct effective biomedical translational research, the investigator must be trained in both clinical science (i.e. the MD Degree) and Engineering (Specifically Biomedical Engineering). This need has been delineated by both academics and industry and is validated by the growing number of MD/PH.D. (BME) programs nationally. USF has the necessary educational components and research infrastructure for this endeavor; both degrees are currently available. The proposed program seeks to provide an integrated experience where the student really fells a part of both the medical/clinical and engineering worlds simultaneously, hence the need for an integrated dual degree program.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
Biomechanics, Biomaterials, Cellular and Tissue Engineering, Cardiovascular Engineering, Neuroengineering, Photonics, Rehabilitation Engineering

ADMISSION INFORMATION
Must meet University requirements (see Graduate Admissions) as well as requirements for each program. Students must satisfy the requirements for the two degrees separately. Refer to the individual program listings for the specific requirements for each degree.

http://www.eng.usf.edu/
Program Admission Requirements
Students apply for the BME degree through the Office of Graduate Studies; Students apply separately for the M.D. Degree through the College of Medicine. Admissions are on the same time schedule as that for general M.D. students. Applicants should contact a program advisor prior to application.

For specific admission requirements, refer to the Ph.D. in Biomedical Engineering program page in the Graduate Catalog and refer to the M.D. program requirements in the College of Medicine.

DEGREE PROGRAM REQUIREMENTS

For specific degree requirements, refer to the Ph.D. in Biomedical Engineering program page in the Graduate Catalog and to the curriculum requirements for the M.D. as posted by the College of Medicine.

This is a seven (7) year program. Students initially complete a non-thesis M.S. in Biomedical Engineering. Then proceed to complete the first three (3) years of the Medical School Curriculum. The following two (2) years focus on the Ph.D. requirements, specifically the completion of coursework, qualifying exams, and dissertation research. In the seventh (7th) year, students complete the fourth (4th) year of Medical School and also complete any Ph.D. requirements as needed. Students must have at least one publication in an appropriate peer-reviewed journal prior to graduation.

Other Requirements

Students establish a Graduate Committee immediately after starting the program, with members from both Engineering and Medicine. This committee guides the student through the program until a formal Ph.D. committee is established, typically in year four or five.

COURSES
See http://ugs.usf.edu/course-inventory
CHEMICAL ENGINEERING PROGRAM

Master of Science in Chemical Engineering (M.S.Ch.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
Fall: February 15
Spring: October 15
Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.0701
Dept. Code: ECH
Program (Major/College): ECH EN
Approved: 1981

Concentrations:
Biomedical and Biotechnology (BEB)

CONTACT INFORMATION

College: Engineering
Department: Chemical & Biomedical Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The Master of Science in Chemical Engineering degree is usually awarded to a student who has an undergraduate degree in Chemical Engineering or strong evidence of undergraduate chemical engineering experience.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
The Chemical & Biomedical Engineering faculty research and development interests cover a broad range of areas in reacting systems, thermodynamics, transport phenomena, systems engineering and characterization, all fundamental as well as applied in biomedical, materials including microelectronic, and environmental domains. Strong collaboration with the College of Medicine, Center of Microelectronic Research, as well as, Departments of Biology, Chemistry, Industrial Engineering, Civil Engineering, Mechanical Engineering, Electrical Engineering, and Computer Science and Engineering makes most programs in Chemical Engineering truly interdisciplinary.

The Department offers core courses in thermodynamics, transport phenomena, reacting systems, math, and process analysis and modeling. A rich variety of electives are available regularly within the department as well as the University. Chemical & Biomedical Engineering research facilities include modern laboratories for polymer synthesis and characterization, supercritical fluid technology, life sciences, process control, instrumentation, computer aided process design, and phase behavior.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- GRE required with preferred minimum scores of >720(Q), >350 (V), and Analytical Writing of 3.0 or greater. Applicants who have successfully completed the Fundamentals of Engineering (FE) Exam offered by the Society of Professional Engineers will be exempted from the GRE requirement.
- An undergraduate Bachelor’s degree or equivalent in Chemical Engineering;
- TOEFL score of 79 (internet-based test), 213 (computer-based test) or 550 (written test)
- Two (2) letters of reference; and
- Statement of research interests.
DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 30 hours post-bachelors
Core Requirements – 12 hours
Course Requirements – 18 hours

This is a thesis option degree that requires an undergraduate degree in Chemical Engineering. A background with undergraduate chemical engineering courses is needed.

Course Requirements – 12 hours
ECH 6105 3 Advanced Thermodynamics
ECH 6285 3 Advanced Transport OR
BME 6634 3 Biotransport Phenomenon
ECH 6515 3 Advanced Reaction Engineering
ECH 6840 3 Math Methods OR
ECH 6412 3 Processes Analysis and Modeling

Additional Course Requirements – 18 hours
Other 5000 or 6000 course or ECH 6907 Individual Study 3
Other 5000 or 6000 course or ECH 6907 Individual Study 3
Other 5000 or 6000 course or ECH 6907 Individual Study 3
Additional approved 5000 or 6000 ECH courses 9

Must have a minimum of 16 hours at 6000 level
Must have a minimum of 12 hours of ECH 6000 level
May include a maximum of 4 hours of independent study

Thesis Option- 6 hours minimum
ECH 6971 6 Thesis

At least 2 members of the Thesis committee must be from tenured or tenure track Chemical & Biomedical Engineering faculty. All thesis option students are required to present a departmental seminar based on their research as part of their oral examination. The examination must be scheduled after the Thesis Supervisory Committee has approved the Thesis. The Graduate Coordinator should be notified so he can coordinate the seminar scheduling. Students in this program are also required to pass the FE (Fundamentals of Engineering Examination) offered by the Society of Professional Engineers.

Comprehensive Exam
Candidates who have at least one publication in a journal or proceedings or presentation at a conference (based on their M.S. Thesis research) may be exempted from this comprehensive examination requirement.

Students wishing to continue on for a Ph.D. must apply to the Office of Graduate Studies.

COURSES
See http://ugs.usf.edu/course-inventory
CHEMICAL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 90
Program Level: Doctoral
CIP Code: 14.0701
Dept. Code: ECH
Program (Major/College): ECH EN
Approved: 1981

Concentrations:
- Manufacturing (MFT)
- Biomedical and Biotechnology (BEB)

CONTACT INFORMATION

College: Engineering
Department: Chemical & Biomedical Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

Contact Program for Information

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
The Chemical & Biomedical Engineering faculty research and development interests cover a broad range of areas in reacting systems, thermodynamics, transport phenomena, systems engineering and characterization, all fundamental as well as applied in biomedical, materials including microelectronic, and environmental domains. Strong collaboration with the College of Medicine, Center of Microelectronic Research, as well as, Departments of Biology, Chemistry, Industrial Engineering, Civil Engineering, Mechanical Engineering, Electrical Engineering, and Computer Science and Engineering makes most programs in Chemical Engineering truly interdisciplinary.

The Department offers core courses in thermodynamics, transport phenomena, reacting systems, math, and process analysis and modeling. A rich variety of electives are available regularly within the department as well as the University. Chemical & Biomedical Engineering research facilities include modern laboratories for polymer synthesis and characterization, supercritical fluid technology, life sciences, process control, instrumentation, computer aided process design, and phase behavior.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- GRE required with preferred minimum scores of >720 (Q), >500 (V), and Analytical Writing of 4.0 or greater;
- An undergraduate Bachelor’s degree or equivalent in Chemical Engineering.
- TOEFL 550 (paper-based total) for international students or 213 (computer-based total);
- Three (3) letters of reference.
- Statement of Research Interests.
DEGREE PROGRAM REQUIREMENTS

Requires an undergraduate degree in Chemical Engineering. Complete Background courses in Chemical Engineering as needed.

Course Requirements:
- ECH 6105 Advanced Thermodynamics 3
- ECH 6285 Advanced Transport 3
- ECH 6840 Math Methods 3
- ECH 6515 Advanced Reaction Engineering 3
- ECH 6r12 Processes Analysis and Modeling 3

Seminar courses
- At least 3 required

2 Tools of Research (Directed Research in 1st year of study)
- At least 4 hours

Concentration area (Engineering)
- Minimum 27 hours in one area;
  at least 20 at 6000 level
- At least 9 hours

5000 or 6000 Math level Courses
- At least 9 hours

Dissertation hours
- (Can register only after you have been admitted as a candidate for Ph.D.)
- At least 20 hours but
  no more than 30 hours

Other 5000 or 6000 course (need a total of 60 hours of coursework)

Other Elements:

1. Diagnostic Examination completed by the end of first year of study. Waived for students who have successfully passed the FE (Fundamentals of Engineering Examination) offered by the Florida Society of Professional Engineers. See details of the diagnostic exam under Departmental requirements for a Ph.D.

2. Qualifying Examination, Complete by the end of the second year of study.

3. Publication in a refereed journal with the student as the first and primary author. At least 1 is required with the expectation that most Ph.D. students will have 3 or more. The publication must be based on your Dissertation research. Presentation at a conference or publication in a proceeding (even if refereed) is not sufficient.

4. See complete list of requirements under Departmental requirements for a Ph.D.

COURSES
See http://ugs.usf.edu/course-inventory
CIVIL ENGINEERING PROGRAM

Master of Civil Engineering (M.C.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.0801
Dept. Code: EGX
Program (Major/College): ECE EN
Approved: 1983

Concentrations:
- Geotechnical Engineering (GTL)
- Materials Engineering and Science (MTL)
- Structural Engineering (STR)
- Transportation Engineering (TPT)
- Water Resources (WRS)

CONTACT INFORMATION

College: Engineering
Department: Civil and Environmental Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The field of Civil Engineering has long been known for its breadth and ability to adapt to the new technological needs of society. The traditional areas of public works, such as highways, bridges, water supply, building design, and wastewater treatment, remain very important. In addition, the modern area of managing the environment has been included in the Civil Engineering domain. Graduates of the programs are prepared for careers with public agencies or private industry and firms involved in planning, design, research and development, or regulation.

The Department has a high bay structures laboratory, which includes an MTS 250 kip testing machine. There are also well-equipped environmental, soils, pavement and hydraulics laboratories. These laboratories include equipment such as an ion chromatograph, atomic absorption unit, environmental chamber, constant rate of stress consolidometer, triaxial units and superpave testing equipment.

The M.C.E. degree provides a student with the opportunity to earn the advanced degree by coursework only. These degrees are recommended for part-time students who find it difficult to do thesis research because of their work commitment or those who wish to complete degree requirements quickly. Many of the department's graduate courses are offered online or on weekday evenings, which permits working students the opportunity to seek a graduate degree.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- Overall GPA 2.75; GPA in major 3.00
- GRE with preferred minimum scores of V 20%, Q 50%, AW 10% or valid fundamentals of engineering (FE) certificate preferred. Verification of FE certification should be obtained from the professional engineering (PE) board where the FE certification was obtained. See the CEE department website for more information: http://www2.eng.usf.edu/cee/graduate/apply.htm.
- TOEFL (International applicants only) 79 (550 paper based exam) or 6.5 (IELTS).
- Two (2) Letters of Reference
- Statement of Purpose
- Exceptions made on a case-by-case basis where warranted.

Pre-requisites
All students must complete the following pre-requisites:
- EGN 3311 Statistics
- EGN 3343 Thermodynamics I
- EGN 3353 Fluid Mechanics
- EGN 3615 Engineering Economy

DEGREE PROGRAM REQUIREMENTS

Total Minimum Hours 30 hours
The minimum coursework requirement is 30 credit hours for students with an undergraduate Engineering degree. Students without an engineering BS will be required to complete undergraduate engineering pre-requisite courses as determined by the Department. Please consult the graduate program coordinator for the list of required courses.

Core Requirements
- A maximum of 12 credits taken outside the CEE department may be applied to meet the degree requirements.
- A maximum of 6 credits of 4000 level courses may be applied to meet the degree requirements.
- A maximum of 6 credits of independent study may be applied to meet the degree requirements.

Concentration Requirements 15 hours
Students may select from the following Concentrations:

Geotechnical Engineering (GTL)
- CEG 5115 Foundation Engineering
- CES 6118 Applied Finite Elements
- 9 additional credits of coursework in Geotechnical engineering or related areas.

Materials Engineering and Science (MTL)
At least 2 courses (6 credits) from the following list:
- CGN 6933 Advanced Construction Materials
- CGN 6720 Electrochemical Diagnostic Techniques
- CGN 6933 Structural Life Prediction
- EMA 5326 Corrosion Control
- EMA 6510 Characterization of Materials
- 9 additional credits of coursework in Materials Engineering and Science or related areas

Structures Engineering (STR)
1 course (3 credits) from the following list of design courses:
- CES 6706 Advanced Concrete
- CES 6835 Design of Masonry Structures
- CES 5715C Pre-stressed Concrete
1 course (3 credits) from the following list of analysis courses:
- CES 6118 Applied Finite element
- CGN 6933 Advanced Structural Analysis
- CGN 6933 Advanced Structural Mechanics

CES 5209 Structural Dynamics  9 additional credits of coursework in Structural Engineering or related areas

Transportation Engineering (TPT)
- TTE 5205 Traffic Systems Engineering
- TTE 5501 Transportation Planning and Economics
- TTE 6507 Travel Demand Modeling
  6 additional credits of coursework in Transportation Engineering or related areas.

Water Resources (WRS)
4 courses (12 credits) from the following list:
- CWR 6235 Free Surface Flow
- CWR 6239 Waves and Beach Protection
- CWR 6305 urban Hydrology
- CWR 6534 Coastal and Estuary Modeling
- CWR 6535 Hydrologic Models
- CGN 6933 Vadose Zone Hydrology
- CGN 6933 Groundwater Hydraulics
- CGN 6933 Advanced Computational Fluid Mechanics
- GLY 6836 Numerical Modeling of Hydro geologic Systems
- GLY 6827C Advanced Hydrogeology
- CWR 6820 Coastal Waves and Structures
- CWR 6538 Advanced Hydrologic Model
  3 additional credits in Water Resources engineering or related areas

Comprehensive Exam

The Portfolio and oral interview are used in lieu of comp

Portfolio
These degrees are coursework only degrees and do not require a thesis; however, a portfolio providing examples of the following is required at the end of the program:
1. Design of complex systems,
2. Written and oral communication skills,
3. Solution of ill-defined or open ended problems.

The Department supports MCE concentration areas in Geotechnical Engineering (GTL), Materials Engineering and Science (MTL), Structural Engineering (STR), Transportation Engineering (TPT) and Water Resources (WRS).

COURSES
See http://ugs.usf.edu/course-inventory
CIVIL ENGINEERING PROGRAM

Master of Science in Civil Engineering (M.S.C.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30

Program Level: Masters

CIP Code: 14.0801

Dept. Code: EGX

Program (Major/College): ECE EN

Approved: 1981

Concentrations:
- Geotechnical Engineering (GTL)
- Engineering for International Development (EFD)
- Materials Engineering and Science (MTL)
- Structural Engineering (STR)
- Transportation Engineering (TPT)
- Water Resources (WRS)

PROGRAM INFORMATION

The field of Civil Engineering has long been known for its breadth and ability to adapt to the new technological needs of society. The traditional areas of public works, such as highways, bridges, water supply, building design, and wastewater treatment, remain very important. In addition, the modern area of managing the environment has been included in the Civil Engineering domain. Graduates of the programs are prepared for careers with public agencies or private industry and firms involved in planning, design, research and development, or regulation.

The Department has a high bay structures laboratory, which includes an MTS 250 kip testing machine. There are also well-equipped environmental, soils, pavement and hydraulics laboratories. These laboratories include equipment such as an ion chromatograph, atomic absorption unit, environmental chamber, constant rate of stress consolidometer, triaxial units and superpave testing equipment.

The M.S.C.E. is a research oriented degree in which the student writes, as a major part of the degree requirements, a thesis that defines, examines, and reports in depth on a subject area relevant to engineering. The purpose of the thesis is to instill in the student the ability to inspect, evaluate, and report on a subject of interest to the engineering profession.

Accreditation: Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- Overall GPA 2.75; GPA in major 3.00
- GRE with preferred minimum scores of V 20%, Q 50%, AW 10% or valid fundamentals of engineering (FE) certificate preferred. Verification of FE certification should be obtained from the professional engineering (PE)
board where the FE certification was obtained. See the CEE department website for more information: http://www2.eng.usf.edu/cee/graduate/apply.htm.

- TOEFL (International applicants only) 79 (550 paper based exam) or 6.5 (IELTS).
- Two (2) letters of reference (three letters for students applying to EFD concentration)
- Statement of Purpose.
- Exceptions made on a case-by-case basis where warranted.

**Pre-requisites**
All students must complete the following pre-requisites:
EGN 3311 Statistics
EGN 3343 Thermodynamics I
EGN 3353 Fluid Mechanics
EGN 3615 Engineering Economy

**DEGREE PROGRAM REQUIREMENTS**

**Total Minimum Hours:** 30 hours
These degrees are for students doing a Master’s thesis. The program consists of a minimum of 24 credit hours of coursework and 6 credit hours of thesis for students with an undergraduate degree in Civil Engineering; students without an Engineering BS will be required to complete undergraduate engineering pre-requisite courses as determined by the Department. Please consult the graduate program coordinator for the list of required courses.

**Core Requirements**

**Concentration Requirements**
Students may select from the following Concentrations:

- **Geotechnical Engineering (GTL)**
  CEG 5115 Foundation Engineering
  CES 6118 Applied Finite Elements
  6 additional credits of coursework in Geotechnical engineering or related areas.

- **Engineering for International Development (EFD)**
  This concentration acknowledges course and international field experience in the area of engineering for international development that considers issues of sustainability, environment, health, gender, and society. Requires students take the following four courses that includes an extended international engineering field experience.
  ENV 6510 Sustainable Development Engineering
  A minimum of one (1) course (3 credits) from the following anthropology courses:
  ANG 6766 Research Methods in Applied Anthropology
  ANG 6730 Socio Cultural Aspects of HIV/AIDS
  ANG 6469 Health, Illness and Culture
  ANT 4930 Infectious Diseases
  A minimum of one (1) course (3 credits) from the following global public health courses:
  PHC 6764 Global Health Principles and contemporary Issues
  PHC 6761 Global Health Assessment Strategies
  CST 6990 for full time global training and service in the U.S. Peace Corps as part of the Engineering for International Development.
  The six (6) research credits required for the degree are associated with research in a developing world context.

- **Materials Engineering and Science (MTL)**
  At least 2 courses (6 credits) from the following list:
  CGN 6933 Advanced Construction Materials
  CGN 6720 Electrochemical Diagnostic Techniques
  CGN 6933 Structural Life Prediction
  EMA 5326 Corrosion Control
  EMA 6510 Characterization of Materials
  6 additional credits of coursework in Materials Engineering and Science or related areas
Structures Engineering (STR)
1 course (3 credits) from the following list of design courses:
   CES 6706 Advanced Concrete
   CES 6835 Design of Masonry Structures
   CES 5715C Pre-stressed Concrete

1 course (3 credits) from the following list of analysis courses:
   CES 6118 Applied Finite element
   CGN 6933 Advanced Structural Analysis
   CGN 6933 Advanced Structural Mechanics
   CES 5209 Structural Dynamics
6 additional credits of coursework in Structural Engineering or related areas

Transportation Engineering (TPT)
   TTE 5205 Traffic Systems Engineering
   TTE 5501 Transportation Planning and Economics
   TTE 6507 Travel Demand Modeling
3 additional credits of coursework in Transportation Engineering or related areas.

Water Resources (WRS)
4 courses (12 credits) from the following list:
   CWR 6235 Free Surface Flow
   CWR 6239 Waves and Beach Protection
   CWR 6305 urban Hydrology
   CWR 6534 Coastal and Estuary Modeling
   CWR 6535 Hydrologic Models
   CGN 6933 Vadose Zone Hydrology
   CGN 6933 Groundwater Hydraulics
   CGN 6933 Advanced Computational Fluid Mechanics
   GLY 6836 Numerical Modeling of Hydrogeologic Systems
   GLY 6827C Advanced Hydrogeology
   CWR 6820 Coastal Eaves and Structures
   CWR 6538 Advanced Hydrologic Model

Comprehensive Exam
The thesis and defense are used in lieu of the comp exam

Thesis Requirements (6 hours)
The Department supports M.S.C.E. concentration areas in Geotechnical Engineering (GTLMaterials Engineering and Science (MTL), Structural Engineering (STR), Transportation Engineering (TPT) and Water Resources (WRS). Students work with a Major Professor and thesis committee to map out their graduate programs.

Other Requirements
   • A maximum of 9 credits taken outside the CEE department may be applied to meet the degree requirements.
   • A maximum of 6 credits of 4000 level courses may be applied to meet the degree requirements.
   • A maximum of 6 credits of independent study may be applied to meet the degree requirements.

COURSES
See http://ugs.usf.edu/course-inventory
CIVIL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 48/78

Program Level: Doctoral

CIP Code: 14.0801

Dept. Code: EGX

Program (Major/College): ECE EN

Approved: 1982

Concentrations:
- Environmental Engineering (ENV)
- Geotechnical Engineering (GTL)
- Materials Engineering and Science (MTL)
- Structures Engineering (STR)
- Transportation Engineering (TPT)
- Water Resources (WRS)

PROGRAM INFORMATION

The field of Civil Engineering has long been known for its breadth and ability to adapt to the new technological needs of society. The traditional areas of public works, such as highways, bridges, water supply, building design, and wastewater treatment, remain very important. In addition, the modern area of managing the environment, including sustainable development, has been included in the Civil Engineering domain. Graduates of the programs are prepared for careers in academia and with public agencies or private industry and firms involved in planning, design, research and development, or regulation.

The department also has a high bay structures laboratory, which includes an MTS 250 kip testing machine. There are also well-equipped environmental, soils, pavement and hydraulics laboratories. These laboratories include equipment for water and air quality analysis, bench and pilot scale reactor studies, field instrumentation for environmental and water resources studies, constant rate of stress consolidometer, triaxial units and superpave testing equipment.

The Ph.D. degree is awarded in recognition of demonstrated scholarly competence and ability to conduct and report original and significant research. Ph.D. students may work in all of the areas of Civil Engineering: Engineering Mechanics, Environmental Engineering, Geotechnical Engineering, Pavement Engineering, Materials Engineering and Science, Structural Engineering, Transportation Engineering and Planning, and Water Resources Engineering.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- GRE with preferred minimum scores of V 45%, Q 65%, and AW 50%.
- TOEFL (International applicants only) 79 (550 paper based exam) or 6.5 IELTS.
- Resume.
- Three (3) letters of reference.
- Statement of Purpose.

DEGREE PROGRAM REQUIREMENTS

Total Program Hours:
For students with an approved master’s degree
For students without a master’s degree

Coursework requirements

Core Requirements
- CGN 6945 Graduate Research Methods (1)
- 3 hours minimum

Additional credits of coursework in Civil Engineering or related areas:
- 33 hours

Directed research or graduate instruction methods may not be used to meet the coursework requirements.

A maximum of 9 credits of independent study may be used to meet the coursework requirements.

Up to 30 credits of coursework form an approved master’s degree may be applied to meet the coursework requirements.

Concentration Requirements
- 15 hours minimum

Students select from the following Concentrations and work with a Major Professor and a Ph.D. committee to determine their course of study.

ENVIRONMENTAL ENGINEERING (ENV)
- ENV 6002 Physical Chemical Principles 3
- EES 6107 Biological Principles 3
- ENV 6666 Aquatic Chemistry 3
- One course from the following
  - CGN 6933 Green Engineering for Sustainability 3
  - CGN 6933 Green Infrastructure for Sustainable Communities 3
  - ENV 6510 Sustainable Development Engineering 3
- 3 additional credits of coursework in Environmental Engineering

GEOTECHNICAL ENGINEERING (GTL)
- CEG 5115 Foundation Engineering 3
- CES 6118 Finite Element Analysis 3
- 9 additional credits of coursework in Geotechnical engineering or related areas

MATERIALS ENGINEERING AND SCIENCE (MTL)
- At least 2 courses (6 credits) from the following list:
  - CGN 6933 Concrete Construction Materials 3
  - CGN 6720 Electrochemical Diagnostic Techniques 3
  - CGN 6933 Structural Life Prediction 3
  - EMA 5326 corrosion Control 3
  - EMA 6510 Characterization of Materials 3
- 9 additional credits of coursework in Materials Engineering and Science or related areas
STRUCTURES ENGINEERING (STR)
1 course (3 credits) from the following list of courses:
- CES 6706 Advanced Concrete
- CES 6835 Design of Masonry Structures
- CES 5715C Pre-stressed Concrete

1 course (3 credits) from the following list:
- CES 6118 Applied Finite Element 3
- CGN 6933 Advanced Structural Mechanics 3
- CGN 6933 Advanced Structural Analysis 3
- CES 5209 Structural Dynamics 3
- CGN 6933 Continuum Mechanics 3

9 additional credits of coursework in Structural Engineering or related areas

TRANSPORTATION ENGINEERING (TPT)
- TTE 5205 Traffic Systems Engineering 3
- TTE 5501 Transportation Planning and Economics 3
- TTE 6507 Travel Demand Modelling 3

6 additional credits of coursework in Transportation Engineering or related areas

WATER RESOURCES (WRS)
a minimum of 4 courses (12 credits) from the following list:
- CWR 6235 Free Surface Flow 3
- CWR 6239 Waves and Beach Protection 3
- CWR 6305 Urban Hydrology 3
- CWR 6534 Coastal and Estuary Modeling 3
- CWR 6535 Hydrologic Models 3
- CGN 6933 Vadose Zone Hydrology 3
- CGN 6933 Groundwater Hydraulics 3
- CGN 6933 Advanced Computational Fluid Mechanics 3
- GLY 6836 Numerical Modeling of Hydrogeologic Systems 3
- GLY 6827C Advanced Hydrogeology 4
- CWR 6820 Coastal Waves and Structures
- CWR 6538 Advanced Hydrologic Model

3 additional credits in WR engineering or related areas

Qualifying Exam
Doctoral students are expected to pass a qualifying examination no later than the semester following the completion of 48 credits of coursework beyond a bachelor’s degree. At minimum, the exam will include a written dissertation proposal and oral defense by the dissertation committee. A written exam in the area of concentration may also be required. Poor performance on the qualifying exam based on the judgment of the committee may result in the student failing the exam. If a student does not pass on the first attempt, he/she may request in writing to repeat the exam. Students who fail the Qualifying examination the 3rd time will be dismissed by the Program.

Dissertation Requirements 20 hours minimum
- CGN 7980 Dissertation (20 hours minimum)

Additional Requirements 9 hours minimum
9 credits of additional coursework, graduate instruction methods, dissertation, or directed research are required.

Publication Requirement
Students must have at least one paper accepted to a peer reviewed journal or peer reviewed conference based on their research carried out during their doctoral studies at USF.

COURSES
http://ugs.usf.edu/course-inventory or http://www2.eng.usf.edu/cee/graduate/graduatecourses.htm
COMPUTER ENGINEERING PROGRAM

Master of Science in Computer Engineering (M.S.C.P.) Degree

DEGREE INFORMATION

Program Admission Deadlines:

U.S. Students
- Fall: February 15
- Spring: October 15
- Summer: no admit

International Students in the U.S.:
- Fall: February 15
- Spring: October 15
- Summer: no admit

International Students outside the U.S.:
- Fall: January 15
- Spring: September 15
- Summer: no admit

Minimum Total Hours:
- 30 thesis; 30 non-thesis

Program Level: Masters
CIP Code: 14.0901
Dept. Code: ESB
Program (Major/College): ECP EN
Approved: 1960

CONTACT INFORMATION

College: Engineering
Department: Computer Science and Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The Department of Computer Science and Engineering offers both a thesis and non-thesis option for the degree of Master of Science in Computer Engineering (M.S.C.P.). The thesis option requires students to pursue a more concentrated range of topics, while the non-thesis option allows students to explore various areas of computer engineering. There is considerable freedom in the choice of the courses.

The breadth of subjects that comprise computer engineering together with the immense diversity of its applications, make it imperative that students in the Master’s program maintain close contact with the Graduate Program Director, or, if choosing the thesis option, with their major professor to achieve a coherent plan of study directed towards a specific goal. In particular, selection of courses should only be made with prior consultation and approval of the major professor or the Graduate Program Director.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
An excellent selection of courses and laboratories support graduate studies in algorithms, artificial intelligence, machine learning, data mining, computer architecture, graphics, networks, computer vision, distributed systems, embedded systems, expert systems, formal verification, image processing, pattern recognition, robotics, databases, software engineering, computer security, compilers, programming languages, and VLSI design and CAD.
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

- The GRE is required for all Ph.D. and M.S. applicants. The median GRE scores of recently admitted students include 770 on the Quantitative portion and a Verbal Total of 450. For GRE tests taken after August 1, we require a minimum of 161 on the Quantitative portion (81 percentile) and a minimum of 150 (44 percentile) on the Verbal. If a candidate is admitted to the M.S. program and later decides to apply to the Ph.D. program, the GRE requirement must be met by the candidate as part of the application process. The GRE will be waived for M.S. degree applicants with an undergraduate degree from an ABET-accredited United States university.

- Minimum grade point average (GPA) of B or equivalent for all coursework completed during the last two years of undergraduate program.

- Submission of TOEFL scores with an Internet-based score of 79 or higher for applicants from non-English speaking countries. If consideration of an assistantship is desired, the speaking score component of the TOEFL must be 26 or above, or a score of 6.5 on the International English Language Testing System, (IELTS).

- The TOEFL requirements may be waived if the applicant meets one of the following conditions:
  - Has scored 500 or higher on the GRE Verbal Test, (Old Scores) or 153 with the New GRE scoring.
  - Has earned a college degree at a U.S. institution of higher learning.
  - Has earned a college degree from an institution whose language of instruction is English, (must be noted on the transcript).
  - Has scored 6.5 on International English Language Testing System, (IELTS).

- Three letters of recommendation

- Statement of purpose

- The applicant must also have mathematical preparation equivalent to that obtained from courses in Calculus through Differential Equations; knowledge of computer science and computer engineering, including logic design, computer architecture, data structure, operating systems and analysis of algorithms. The majority of students accepted to the program possess an undergraduate degree in Computer Science, Computer Engineering, Electrical Engineering, or Mathematics; however, students who hold an undergraduate degree in a related field are encouraged to apply.

DEGREE PROGRAM REQUIREMENTS

Total Minimum Hours: 30 hours

Core Requirements: 9 hours

Successful completion of three core graduate-level courses is required:

- EEL 6764 Principles of Computer Architecture 3
- COP 6611 Operating Systems 3
- COT 6405 Introduction to the Theory of Algorithms 3
Electives:
The thesis option students must select at least 15 hours and non-thesis students must select at least 21 hours from the list of available graduate elective courses below in consultation with the Graduate Program Director of individual advisor:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CAP 5400</td>
<td>Digital Image Processing</td>
<td>3</td>
</tr>
<tr>
<td>CDA 5416</td>
<td>Introduction to Computer-Aided Verification</td>
<td>3</td>
</tr>
<tr>
<td>CAP 5625</td>
<td>Introduction to Artificial Intelligence</td>
<td>3</td>
</tr>
<tr>
<td>CAP 5682</td>
<td>Expert and Intelligent Systems</td>
<td>3</td>
</tr>
<tr>
<td>CAP 5771</td>
<td>Data Mining</td>
<td>3</td>
</tr>
<tr>
<td>EEL 5771</td>
<td>Introduction to Computer Graphics I</td>
<td>3</td>
</tr>
<tr>
<td>CNT 6215</td>
<td>Computer Networks</td>
<td>3</td>
</tr>
<tr>
<td>CAP 6415</td>
<td>Computer Vision</td>
<td>3</td>
</tr>
<tr>
<td>CAP 6455</td>
<td>Advanced Robotic Systems</td>
<td>3</td>
</tr>
<tr>
<td>CAP 6615</td>
<td>Neural Networks</td>
<td>3</td>
</tr>
<tr>
<td>COP 6621</td>
<td>Programming Languages and Translation</td>
<td>3</td>
</tr>
<tr>
<td>EEL 6706</td>
<td>Testing and Fault Tolerance in Digital Systems</td>
<td>3</td>
</tr>
<tr>
<td>CAP 6736</td>
<td>Geometric Modeling</td>
<td>3</td>
</tr>
<tr>
<td>EEL 6766</td>
<td>Advanced Computer Architecture</td>
<td>3</td>
</tr>
<tr>
<td>CIS 6900</td>
<td>Independent Study</td>
<td>1-19</td>
</tr>
<tr>
<td>CIS 6930</td>
<td>Special Topics</td>
<td>1-5</td>
</tr>
<tr>
<td>CIS 6940</td>
<td>Graduate Instruction Methods</td>
<td>1-4</td>
</tr>
<tr>
<td>CIS 6946</td>
<td>Internships/Practicums/Clinical Practice</td>
<td>0-3</td>
</tr>
<tr>
<td>CIS 6971</td>
<td>Thesis: Master’s</td>
<td>2-19</td>
</tr>
</tbody>
</table>

Thesis Option:
The thesis option requires completion of 24 credit hours of CSE graduate-level courses (9 credit hours core and 15 hours of electives) and 6 credit hours of thesis in computer engineering related problems, as determined by the Major Professor and documented in the Plan of Work. At least 16 credit hours must be at the 6000 level. With prior permission from the Graduate Program Director, students can take a maximum of 3 hours of Independent Study or Internship, a maximum of 3 hours of one-hour seminar courses, and up to one graduate level course (3 credit hours) outside of the department.

Non-Thesis Option:
The non-thesis option requires 30 credit hours, with 9 credit hours of core courses and 21 hours of electives. At least 16 credit hours must be at the 6000 level. At least 6 hours of electives should be in the following topic areas: CMOS VLSI Design, Digital Circuit Synthesis, Formal Verification, Testing and Fault Tolerance, Low-Power VLSI, Robotics, or Computer Networks, as determined by the Graduate Program Coordinator and documented in the Plan of Work. With prior permission from the Graduate Program Director, students can take a maximum of 3 hours of Independent Study or Internship, a maximum of 3 hours of one-hour seminar courses, and up to one graduate level course (3 credit hours) outside of the department.

Graduation Requirements:
For the thesis option, students must defend and pass the thesis and have a GPA of 3.0 or better. Non-Thesis Option students must obtain a letter “B” or better in the core graduate courses and have a GPA of 3.0 or better.

COURSES
See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
COMPUTER SCIENCE PROGRAM

Master of Science in Computer Science (M.S.C.S.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: No admit

International Students in the U.S.:
- Fall: February 15
- Spring: October 15
- Summer: No admit

International Students Outside the U.S.:
- Fall: January 15
- Spring: September 15
- Summer: No admit

Minimum Total Hours: 30 thesis; 30 non-thesis
Program Level: Masters
CIP Code: 11.0701
Dept. Code: ESB
Program (Major/College): ECC EN
Approved: 1960

CONTACT INFORMATION

College: Engineering
Department: Computer Science and Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The Department of Computer Science and Engineering offers a thesis and non-thesis option for the degree of Master of Science in Computer Science (M.S.C.S.) The thesis option requires students to pursue a more concentrated range of topics. The non-thesis option offers students some experience in many areas of computer science. There is considerable freedom in the choice of the courses.

The breadth of subjects which are part of computer science together with the immense diversity of its applications, make it imperative that students in the Master’s program maintain close contact with the Graduate Program Director, or, if choosing the thesis option, with their major professor in order to achieve a coherent plan of study directed towards a specific goal. In particular, election of courses should only be made with prior consultation and approval of the Major Professor or the Graduate Program Director.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
An excellent selection of courses and laboratories support graduate studies in algorithms, artificial intelligence, machine learning, data mining, computer architecture, graphics, networks, computer vision, distributed systems, embedded systems, expert systems, formal verification, image processing, pattern recognition, robotics, databases, software engineering, computer security, compilers, programming languages, and VLSI design and CAD.
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

- The GRE is required for all Ph.D. and M.S. applicants. The median GRE scores of recently admitted students include 770 on the Quantitative portion and a Verbal Total of 450. For GRE tests taken after August 1, we require a minimum of 161 on the Quantitative portion (81 percentile) and a minimum of 150 (44 percentile) on the Verbal. If a candidate is admitted to the M.S. program and later decides to join the Ph.D. program, the GRE requirement must be met by the candidate as part of the application process. The GRE will be waived for M.S. degree applicants with an undergraduate degree from an ABET-accredited United States university.

- Minimum grade point average (GPA) of “B” (or equivalent) for all coursework completed during the last two years of undergraduate program.

- Submission of TOEFL scores with an Internet-based score of 79 or higher for applicants from non-English speaking countries. If consideration of an assistantship is desired, the speaking score component of the TOEFL must be 26 or above. The TOEFL requirements may be waived if the applicant meets one of the following conditions:
  - Has scored 500 or higher on the GRE Verbal Test, (Old Scores) or 153 with the New GRE scoring.
  - Has earned a college degree at a U.S. institution of higher learning.
  - Has earned a college degree from an institution whose language of instruction is English, (must be noted on the transcript).
  - Has scored 6.5 on International English Language Testing System, (IELTS).

- Three letters of recommendation.

- Statement of purpose.

- The applicant must also have mathematical preparation equivalent to that obtained from courses in Calculus through Differential Equations; knowledge of computer science and computer engineering, including logic design, computer architecture, data structure, operating systems and algorithms. The majority of students accepted to the Program possess an undergraduate degree in Computer Science, Computer Engineering, Electrical Engineering, or Mathematics. However, students who hold an undergraduate degree in a related field are encouraged to apply.

DEGREE PROGRAM REQUIREMENTS

Total Minimum hours: 30 hours

Core Requirements: 9 hours
Successful completion of three core graduate-level courses is required. For non-thesis option, students must make a grade of “B” or higher in these core courses:

- COP 6611 Operating Systems 3
- EEL 6764 Principles of Computer Architecture 3
- COT 6405 Introduction to the Theory of Algorithms 3

Electives:
Thesis option students must select at least 15 hours and non-thesis option students must select at least 21 hours from the list of available graduate elective courses below in consultation with the Graduate Program Director or individual advisor:

- CAP 5400 Digital Image Processing 3
- CDA 5416 Introduction to Computer-Aided Verification 3
- CAP 5625 Introduction to Artificial Intelligence 3

http://www.eng.usf.edu/
CAP 5682 Expert and Intelligent Systems 3
CAP 5771 Data Mining 3
EEL 5771 Introduction to Computer Graphics I 3
CNT 6215 Computer Networks 3
CAP 6415 Computer Vision 3
CAP 6455 Advanced Robotic Systems 3
CAP 6615 Neural Networks 3
COP 6621 Programming Languages and Translation 3
EEL 6706 Testing and Fault Tolerance in Digital Systems 3
CAP 6736 Geometric Modeling 3
EEL 6766 Advanced Computer Architecture 3
CIS 6900 Independent Study 1-19
CIS 6930 Special Topics 1-5
CIS 6940 Graduate Instruction Methods 1-4
CIS 6946 Internships/Practicums/Clinical Practice 0-3

**Thesis Option:**
CIS 6971 Thesis: Master’s 2-19

The thesis option requires the completion of 24 credit hours of CSE graduate-level courses (9 credit hours of core courses and 15 hours of electives) and 6 credit hours of thesis in computer science related problems, as determined by the Major Professor and documented in the Plan of Work. At least 16 credit hours must be at the 6000 level. With prior permission from the Graduate Program Director, students can take a maximum of 3 hours of Independent Study or Internship, a maximum of 3 hours of one-hour seminar courses, and up to one graduate level course (3 credit hours) outside of the department.

**Non-Thesis Option:**
The non-thesis option requires 30 credit hours, with 9 credit hours of core courses and 21 hours of electives. At least 16 credit hours must be at the 6000 level. At least 6 hours of electives should be in the following topic areas: advanced algorithms, compilers, databases, parallel computing and distributed systems, computer security, data mining, machine learning, programming languages, or software engineering, as determined by the Graduate Program Director and documented in the Plan of Work. With prior permission from the Graduate Program Director, students can take a maximum of 3 hours of Independent Study or Internship, a maximum of 3 hours of one-hour seminar courses, and up to one graduate level course (3 credit hours) outside of the department.

**Graduation Requirements:**
For the thesis option, students must defend and pass the thesis and have a GPA of 3.00 or better. Non-Thesis Option students must obtain a letter “B” or better in the core graduate courses and have a GPA of 3.00 or better.

**COURSES**
See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
COMPUTER SCIENCE AND ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:

US Students:
- Fall: February 15
- Spring: October 15
- Summer: No admit

International Students inside the U.S.:
- Fall: February 15
- Spring: October 15
- Summer: No admit

International Students Outside the U.S.:
- Fall: January 15
- Spring: September 15
- Summer: No admit

Minimum Total Hours: 72 post-bachelors
Program Level: Doctoral
CIP Code: 14.0901
Dept. Code: ESB
Program (Major/College): CSE EN
Approved: 1984

CONTACT INFORMATION

College: Engineering
Department: Computer Science and Engineering
Contact Information: www.grad.usf.edu

PROGAM INFORMATION

The degree of Doctor of Philosophy is conferred in recognition of a candidate’s highest level of scholarly competence and demonstrated capability to independently conduct and report significant research in computer science and engineering. This achievement requires more than an accumulation of course credits over a stated period of residence. Scholarly competence is achieved through systematic study and investigation in the chosen discipline at an advanced level. The major professor and at least two committee members will be from the Computer Science and Engineering department. Research capability is developed during the course of study and is achieved through the completion of significant and independent research. The results of this research must be formally presented in a written dissertation and successfully defended before an examining committee. The dissertation must demonstrate the significance of the research as well as the candidate’s ability to organize and present her/his results in a professional manner.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
An excellent selection of courses and laboratories support graduate studies in algorithms, artificial intelligence, machine learning, data mining, computer architecture, graphics, networks, computer vision, distributed systems, embedded systems, expert systems, formal verification, image processing, pattern recognition, robotics, databases, software engineering, computer security, compilers, programming languages, VLSI design, and CAD.
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

- The GRE is required for all Ph.D. applicants. The median GRE scores of recently admitted students include 770 on the Quantitative portion and a Verbal Total of 450. For GRE tests taken after August 1, we require a minimum of 161 on the Quantitative portion (81 percentile) and a minimum of 150 (44 percentile) on the Verbal.

- Minimum grade point average (GPA) of B average (or equivalent) for all coursework completed during the last two years of undergraduate program.

- Submission of TOEFL scores with an Internet-based score of 79 or higher for applicants from non-English speaking countries. If consideration of an assistantship is desired, the speaking score component of the TOEFL must be 26 or above.

- The TOEFL requirements may be waived if the applicant meets one of the following conditions:
  - Has scored 500 or higher on the GRE Verbal Test, (Old Scores) or 153 with the New GRE scoring.
  - Has earned a college degree at a U.S. institution of higher learning.
  - Has earned a college degree from an institution whose language of instruction is English, (must be noted on the transcript).
  - Has scored 6.5 on International English Language Testing System, (IELTS).

- Three letters of recommendation

- Statement of purpose

- The applicant must also have mathematical preparation equivalent to that obtained from courses in Calculus through Differential Equations; knowledge of computer science and computer engineering, including logic design, computer architecture, data structures, operating systems, and analysis of algorithms. Students are assumed to have good programming skills. The majority of students accepted to the program possess an undergraduate degree in Computer Science, Computer Engineering, Electrical Engineering, or Mathematics; however, students who hold an undergraduate degree in a related field are encouraged to apply.

DEGREE PROGRAM REQUIREMENTS

The requirements for obtaining the doctoral degree can be met by fulfilling the minimum requirements below. These requirements and the various committees appointed to oversee the completion of these requirements are explained in detail below:


2. Completion of a Major Research-Area paper within one year after qualifier examinations are passed.

3. Completion of a doctoral dissertation representing significant, original research.
Total Program hours

A minimum of 72 semester hours including dissertation hours beyond the baccalaureate degree are required of all Ph.D. students.

Coursework – 33 credit hours
Independent Study/Dir Research – 15 hours
Dissertation – 20 credit hours
Additional – 4 credit hours (courses or dissertation)

Core Requirements – 9 credit hours
All PhD Students are required to successfully complete: COT 6405 Introduction to the Theory of Algorithms – 9

Required Coursework – 48 hours (includes 9 hours of Core Requirements)
The distribution of these hours is as follows:
- At least 33 credit hours in coursework excluding independent study and directed research. The exact distribution of these hours in the Computer Science and Engineering discipline will be determined by the student and the supervisory committee to provide the student with a stimulating educational experience.
- Up to 15 credit hours of independent study/directed research.
  - CIS 6900 Independent Study
  - CIS 7910 Directed Research
- Additional 4 credit hours are required, either through the completion of additional courses or through additional dissertation hours.

Students select the specific courses in conjunction with the advisor and committee from the list of available graduate elective courses below in consultation with the Graduate Program Director or individual advisors/dissertation committee.

Departmental Course Options (examples)

- CAP 5400 Digital Image Processing
- CDA 5416 Introduction to Computer-Aided Verification
- CAP 5625 Introduction to Artificial Intelligence
- CAP 5682 Expert and Intelligent Systems
- CAP 5771 Data Mining
- EEL 5771 Introduction to Computer Graphics I
- CNT 6215 Computer Networks
- CAP 6415 Computer Vision
- CAP 6455 Advanced Robotic Systems
- CAP 6615 Neural Networks
- COP 6621 Programming Languages and Translation
- EEL 6706 Testing and Fault Tolerance in Digital Systems
- CAP 6736 Geometric Modeling
- EEL 6766 Advanced Computer Architecture
- CIS 6900 Independent Study
- CIS 6930 Special Topics
- CIS 6940 Graduate Instruction Methods
- CIS 6946 Internships/Practicums/Clinical Practice
- CIS 6971 Thesis: Master’s

Doctoral Screening/Qualifying Examination
Students must pass the Ph.D. Qualifying examinations in Computer Architecture, Operating Systems, and Theory of Algorithms within one year of enrollment.

Admission to Candidacy
A student will not be admitted to candidacy until a Doctoral committee has been appointed, and the committee has certified that the student has successfully completed the comprehensive qualifying examination and demonstrated the qualifications necessary to successfully complete the requirements for the degree. The admission to Candidacy form must be approved by the Dean of the college and forwarded to the Dean of Graduate Studies for final approval. The student may
Dissertation

CIS 7980 Dissertation
The student’s progress in the program is monitored by a supervisory doctoral committee, which is usually appointed at an early stage in the student’s program. This committee consists of at least five members, one of whom is outside the College of Engineering. The Major Professor will be a member of the Computer Science and Engineering Department. Normally, two more Computer Science and Engineering faculty serve on the committee with a member in another department in the college.

The student must conduct research of sufficient quality that demonstrates an independent and original contribution to the field of computer science and engineering. Students must take at least 20 semester hours of doctoral dissertation credits; the exact number of credits is determined by the candidate’s supervisory committee. It is strongly recommended that doctoral students submit journal articles for publication relevant to dissertation research.

Dissertation Defense
A doctoral candidate must defend her/his research before her/his committee. The defense is usually open to the university community and conducted in accordance with the university’s general rules and regulations. The defense involves a formal presentation of the dissertation followed by a critical exchange between the candidate and the committee. The committee chairman moderates the proceedings and determines procedure, originality of the research, and contributions made by the candidate.

COURSES
See http://ugs.usf.edu/course-inventory
ELECTRICAL ENGINEERING PROGRAM

Master of Science in Electrical Engineering (M.S.E.E.) Degree

DEGREE INFORMATION

<table>
<thead>
<tr>
<th>Program Admission Deadlines:</th>
<th>CONTACT INFORMATION</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fall: February 15</td>
<td>College: Engineering</td>
</tr>
<tr>
<td>Spring: October 15</td>
<td>Department: Electrical Engineering</td>
</tr>
<tr>
<td>Summer: February 15</td>
<td>Contact Information: <a href="http://www.grad.usf.edu">www.grad.usf.edu</a></td>
</tr>
</tbody>
</table>

| Minimum Total Hours: 30     | |
| Program Level: Masters     | |
| CIP Code: 14.1001           | |
| Dept. Code: EGE             | |
| Program (Major/College): EEL EN | |
| Approved: 1981              | |

PROGRAM INFORMATION

The Department of Electrical Engineering offers both doctoral and masters level degrees. The major areas of research and instruction in the Department are: semiconductor materials, microelectronic manufacturing, MEMS, nanotechnology, VLSI design, digital signal processing, communication theory, wireless communications, microwave engineering, power systems and controls, and biomedical materials and imaging. The Department’s research efforts are supported by well-equipped laboratories in the areas of silicon processing, compound semiconductors, electro-optics, IC design, thin dielectric films, communications and signal processing, power systems, nanotechnology, MEMS, micro/millimeter waves, biomedical materials and imaging, and bioengineering.

Current and previous Ph.D. dissertations explored the areas of microelectronics (materials and devices of elemental and compound semiconductors, circuit design, modeling, testing, and reliability); communications and signal processing (communication networks, packet switching, satellite communications, communications software, and VLSI for signal processing); systems and controls; solid state material and device processing and characterization; electro-optics, electromagnetic, microwave and millimeter-wave engineering (antennas, devices, systems); and biomedical engineering. Master’s programs include options in semiconductor materials and processes, VLSI design, communications and signal processing, power systems and controls, microwave and millimeter-wave engineering, and biomedical engineering.

Accreditation
Accredited by the Commission on Colleges of the Southern Association of Colleges and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- Minimum 3.00 GPA
- Three Letters of Recommendation
- Resume
- Statement of Purpose
- TOEFL score of 550; 213 on computerized test; 79 on internet based exam
### DEGREE PROGRAM REQUIREMENTS

**Thesis Option**

**Required Courses**

<table>
<thead>
<tr>
<th>Course</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>EEL 6426</td>
<td>RF/MW Circuits I and EEL-6427 RF/MW Circuits II</td>
</tr>
<tr>
<td>EEL-6486C</td>
<td>EM Field Theory and EEL-6487 Adv. EM Field Theory or EEL-6481 Num. Techniques in Electromagnetics</td>
</tr>
<tr>
<td>EEL-5462</td>
<td>Antenna Theory and EEL-6463 Adv. Antenna Theory or EEL-6481 Num. Techniques in Electromagnetics</td>
</tr>
<tr>
<td>EEL-6935</td>
<td>Monolithic MW Circuits and EEL-6936 Adv. Monolithic MW Circuits</td>
</tr>
<tr>
<td>BME 6000</td>
<td>Intro to Biomedical Eng. and GM-7930 Anatomy for Bio Engineers or EEL-6936 Bio Image Processing</td>
</tr>
<tr>
<td>EEL-6935</td>
<td>Bioelectricity and EEE-6273 Chemical and Bio Sensor Microsystems</td>
</tr>
<tr>
<td>EEL-6502</td>
<td>DSP-I and EEL-6752 DSP-II or EEL-6586 Speech Signal Processing</td>
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<tr>
<td>EEE-5344</td>
<td>Digital CMOS VLSI Design and EEE-6936 VHDL or EEE-6936 Low Power VLSI Design</td>
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<td>EEE-5382</td>
<td>Physical Basis of Microelectronics and EEE-6353 Semiconductor Device Theory I</td>
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<td>EEE-6353</td>
<td>Semi-Conductor Device Theory I and EEE-6358 Semi-Conductor Device Theory II</td>
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<tr>
<td>EEE 5356</td>
<td>Integrated Circuit Technology and EEE-6936 Adv. Integrated Circuit Technology</td>
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<td>EEE-6355</td>
<td>Compound Semiconductor Technology and EEE-6318 Characterization of Semiconductors</td>
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<tr>
<td>EEE-5631</td>
<td>Digital Control Systems and EEL-6613 Modern Control Theory</td>
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<tr>
<td>EEE-6936</td>
<td>VHDL and EEL-6936 Rapid System Prototyping</td>
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<td>EEE-5250</td>
<td>Electric Power Systems I and EEL-6935 Electric Power Systems II</td>
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<td>EEE-6935</td>
<td>Industrial Power Distribution I and EEL-6936 Industrial Power Distribution II</td>
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<tr>
<td>EEE-5935</td>
<td>Utility Power Distribution I and EEL-6935 Utility Power Distribution II</td>
</tr>
<tr>
<td>EEE-6935</td>
<td>Electric Machines and Drives and EEL-6936 Power Electronics</td>
</tr>
<tr>
<td>EEE-6425</td>
<td>Intro to Nanotechnology and EEL-6936 Nanotechnology II</td>
</tr>
<tr>
<td>EEE-6935</td>
<td>Micro Electro Mechanical Systems I and EEL-6936 Micro Electro Mechanical Systems II</td>
</tr>
</tbody>
</table>

*Other sequence must be approved by the Graduate Program Director*

**Electives:**

<table>
<thead>
<tr>
<th>Minimum elective hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>Thesis – 6 hours</td>
</tr>
<tr>
<td>Coursework only – 12 hours</td>
</tr>
</tbody>
</table>
Students may adopt suggested electives from the Department Graduate Handbook, by track or emphasis area of their choice. All courses must be graduate level. Students should refer to university requirements when choosing courses bearing in mind allowed quantities of 5xxx and 6xxx coursework. Special selections must be approved by the Program Coordinator.

Comprehensive Exam
The University requires all Master’s students to be assessed by a comprehensive examination. The Department maintains two versions of this exam according to the student pathway to degree, i.e. Thesis or Non-Thesis as follows:

Thesis students:
Student’s written thesis and Public Defense of same constitute the comprehensive exam. Student is provided a rubric that they will be assessed by relative to their written document and presentation. The Committee reports this assessment to the Department for final approval.

Non-Thesis Students:
In lieu of the Comprehensive Exam, a portfolio addressing the content from a capstone course in the primary area of study, content from a course in a secondary area of study, and content from a core mathematics course will be submitted upon graduation. The graduate program coordinator, chair of the department, and the vice chair of the department will evaluate the submissions according to the overall quality of the writing, the clarity of the explanation of how the outcomes were achieved, and the quality of the examples that are included.

Thesis – 6 hours
EEL 6971 Thesis (6)

COURSES
See http://ugs.usf.edu/course-inventory
**ELECTRICAL ENGINEERING PROGRAM**

**Doctor of Philosophy (Ph.D.) Degree**

### DEGREE INFORMATION

**Program Admission Deadlines:**
- **Fall:** February 15
- **Spring:** October 15
- **Summer:** February 15

**Minimum Total Hours:**
- 72 (Post-bacc)
- 39 (post-master’s)

**Program Level:** Doctoral

**CIP Code:** 14.1001

**Dept. Code:** EGE

**Program (Major/College):** EEL EN

**Approved:** 1982

### CONTACT INFORMATION

**College:** Engineering

**Department:** Electrical Engineering

**Contact Information:** [www.grad.usf.edu](http://www.grad.usf.edu)

### PROGRAM INFORMATION

The Department of Electrical Engineering offers both doctoral and masters level degrees. The major areas of research and instruction in the Department are: semiconductor materials, microelectronic manufacturing, MEMS, nanotechnology, VLSI design, digital signal processing, communication theory, wireless communications, microwave engineering, power systems and controls, and biomedical materials and imaging. The Department’s research efforts are supported by well-equipped laboratories in the areas of silicon processing, compound semiconductors, electro-optics, IC design, thin dielectric films, communications and signal processing, power systems, nanotechnology, MEMS, micro/millimeter waves, biomedical materials and imaging, and bioengineering.

Current and previous Ph.D. dissertations explored the areas of microelectronics (materials and devices of elemental and compound semiconductors, circuit design, modeling, testing, and reliability); communications and signal processing (communication networks, packet switching, satellite communications, communications software, and VLSI for signal processing); systems and controls; solid state material and device processing and characterization; electro-optics, electromagnetic, microwave and millimeter-wave engineering (antennas, devices, systems); and biomedical engineering. Master’s programs include options in semiconductor materials and processes, VLSI design, communications and signal processing, power systems and controls, microwave and millimeter-wave engineering, and biomedical engineering.

**Accreditation**
Accredited by the Commission on Colleges of the Southern Association of Colleges and Schools.

### ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

**Program Admission Requirements**
- Minimum 3.00 GPA
- GRE (with preferred minimum scores of Q> 155 (61%), V>146 (28%))
- TOEFL score of 550; 213 on computerized test; 79 internet based exam.
- Three (3) Letters of Reference
- Statement of Purpose
- Resume
DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 72 post-bacc
42 post-masters

The student’s supervisory committee is responsible for evaluating his/her overall transcript to ensure that the following distributional requirements are met:

Program of Study

Core Requirements 30 hours
Minimum 30 hours formal regularly scheduled graduate course work in the engineering area of study, or other graduate courses associated with electrical engineering as approved by the Graduate Program Director. (not necessarily electrical engineering courses)

Mathematics and Statistics 9 hours
Minimum 9 hours in mathematics or statistics courses (not necessarily math department courses).

Electives/Directed Research/Independent Study 13 hours

Dissertation 20 hours minimum
EEL 7980 Dissertation
Each Professor will have his/her own section for dissertation hours.

Total hours: Minimum 72 hours total beyond B.S. degree.

Note: Students entering the doctoral program with an earned master’s degree from another institution, other than USF, must take at least nine (9) credit hours of 6000 level EE courses at USF. The student’s supervisory committee is responsible for evaluating his/her overall transcript to ensure that the distributional requirements are met.

Please contact Electrical Engineering for additional information

COURSES
See http://ugs.usf.edu/course-inventory
ENGINEERING MANAGEMENT PROGRAM

Master of Science in Engineering Management (M.S.E.M.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 15.1501
Dept. Code: EGS
Program (Major/College): EMA EN
Approved: 1982

PROGRAM INFORMATION

This program is designed to prepare engineers from various disciplines to make the transition to technical management. Courses in the program involve concepts in engineering management, resource management, strategic planning, and productivity. They combine qualitative approaches with quantitative techniques. Courses are available on campus or through distance learning.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- BS in Engineering or equivalent.
- Minimum 3.00 GPA upper level
- GRE may be required
- Letter of recommendation.
- TOEFL score of 79 or higher on internet-based test, 213 or higher on computer-based test, or 550 or higher on paper-based test
- Resume
- Two years professional experience or internship may be required as part of the program

DEGREE PROGRAM REQUIREMENTS

A minimum of 30 credits of approved coursework beyond the bachelor level is required, 18 credits of core work and 12 credits of electives. Up to 6 hours of advanced courses in the student’s area of specialty may be taken as electives. A thesis option is available to M.S.E.M. students who are interested in applied research. In the thesis option, 18 credits of core work, 6 credits of electives, and 6 credits of thesis are the minimum required.

http://www.eng.usf.edu/
The required 18 credits of core work are divided into three components: 12 credits in the general core area, 3 credits in the quantitative core area, and 3 credits in the job design core area. An undergraduate statistics course with a grade of C or higher is a prerequisite for the quantitative core area. Otherwise students must additionally take EGN 3443 Probability & Statistics for Engineers as a prerequisite.

**General Core Area: 12 credits**

- EIN 5182 Principles of Engineering Management
- EIN 6386 Management of Technological Change
- EIN 5350 Technology and Finance
- EIN 6183 Engineering Management Policy & Strategy (Capstone: must be taken after all core work requirements have been fulfilled)

**Quantitative Core Area: 3 credits must be selected from the following options, as approved by advisor. The other courses may be taken as electives.**

- ESI 5206 Operations Research for Engineering Managers
- ESI 5219 Statistical Methods for Engineering Managers
- ESI 6247 Statistical Design Models

**Job Design Core Area: 3 credits must be selected from the following options, as approved by advisor. The other course may be taken as an elective.**

- EIN 6108 Engineering Management: Human Relations
- EIN 6319 Work Design, Motivation & Productivity

**Electives: 12 credits minimum must be selected from the following options, as approved by advisor.**

- EIN 6179 Advanced TQM Methods: Six Sigma
- EIN 6936 Benchmarking
- ESI 5522 Computer Simulation
- EIN 6217 Construction Safety Engineering
- EIN 5201 Creativity in Technology
- EIN 6275 Design Controls for Medical Devices
- EIN 5452 Engineering a Lean Enterprise
- EIN 6215 Engineering Systems Safety
- ESI 6605 Engineering Data Mining
- EIN 6324 Engineering the Supply Chain
- EIN 6936 Graduate Research Seminar
- EIN 6433 Human Factors Engineering in Medical Devices
- EIN 6112 Information Systems Design for Engineering
- ESI 6448 Integer Programming
- EIN 6934 International Project Management
- EIN 6435 International Regulations for Medical Devices
- EIN 6178 ISO 9000/14000
- ESI 6491 Linear Programming & Network Optimization
- EIN 5510 Manufacturing Systems Analysis
- EIN 6392 New Product Development
- EIN 6420 Non-Linear Programming
- EIN 6216 Occupancy Safety Engineering
- EIN 6430 Overview of Regulated Industries
- EIN 6336 Production Control Systems
- EIN 6145 Project Management
- EIN 6431 Regulatory Quality Systems & Controls for Medical Devices
- EIN 6432 Regulated Product Approval Process
- ESI 5236 Reliability Engineering
- EIN 6935 Strategic Marketing Assessment
- EIN 6936 Strategies in Technical Entrepreneurship
ESI 6213  Stochastic Decision Models I
EIN 6934  Tech Venture Strategy
EIN 6145  Technical Entrepreneurship
EIN 6106  Technology & Law
EIN 6121  Technology & Markets
EIN 5174  Total Quality Management (TQM) Concepts
EIN 6225  Total Quality Management (TQM) Seminar
EIN 6936  Venture Capital & Private Equity
EIN 5275  Work Physics / Biomechanics

COURSES
See http://ugs.usf.edu/course-inventory
ENGINEERING SCIENCE PROGRAM

Master of Science in Engineering Science (M.S.E.S.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
Fall: February 15
Spring: October 15
Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.0101
Dept. Code: DEA
Program (Major/College): EGC EN

Concentrations:
Chemical & Biomedical Engineering (CHB)
Electrical Engineering (PEE)
Environmental Engineering (EVE)
Transportation Engineering (TPE)

PROGRAM INFORMATION

The M.S.E.S degree provides students without a first degree in engineering with the opportunity to earn an advanced degree by combining coursework with an optional research thesis. Students who have a prior bachelor’s level degree in engineering can also take advantage of this degree program by pursuing interdisciplinary coursework and research through the academic programs hosted in the College of Engineering.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

- An undergraduate Bachelor’s degree or equivalent in Engineering or Science or closely related field;
- Undergraduate GPA of 3.00 or higher;
- GRE with preferred minimum scores of 143 (Verbal), 152 (Quantitative), 3.0 (Analytical Writing);
- TOEFL for international students: 213 (computer based total) or 79 (internet based) or 6.5 (IELTS);
- Two letters of recommendation (3 letters of recommendation for students interested in the Peace Corps Masters International Program);
- Statement of purpose/research interests and resume;
- Host Department must be selected on the following form: http://www.eng.usf.edu/programsOfStudy/MSESIntakeForms.htm

Exceptions to above requirements may be made on a case-by-case basis.
DEGREE PROGRAM REQUIREMENTS

Total Minimum Hours  30 credits

Core – 1 hour
Concentration or Approved Area of Study – 18 hours
Electives – 11 hours

A program of study for all students must be approved by the Graduate Program Coordinator of the host Department.

Core Course Requirement – 1 hour
CGN 6945  1  Graduate Research Methods

Concentration or Area of Study – 18 hours
Students select from either one of the following concentrations or an area of study approved by the Graduate Program Director in the host department:

Chemical & Biomedical Engineering (CHB)
Two courses from the following:
ECN 6105  3  Advanced Thermodynamics
ECN 6285  3  Advanced Transport Phenomena
ECN 6840  3  Mathematical Methods for Chemical Engineering
ECN 6515  3  Reacting Systems
ECN 6412  3  Process Analysis and Modelling
BME 6634  3  Biotransport Phenomena

Plus 12 additional credits of coursework in ECH or BME (may include 6 credits of Thesis and 4 credits of Independent Study)

Electrical Engineering (PEE)
Two courses from the following
EGN 5421  3  Engineering Apps for Vector Analysis
EGN 5422  3  Engineering Apps of Partial Diff. Eq.
EGN 5423  3  Mathematics for Comm Eng 3
EGN 5425  3  Engineering Applications of Complex Analysis
EGN 5425  3  Matrix Theory
EEL 6545  3  Random Processes
PHC 6050  3  Biostatistics I

Plus 12 additional credits - Four courses, two sequences, from one of seven tracks. Each sequence consists of an entry level graduate course followed by a more advanced course that has the first course as a pre-requisite.
Some examples are:
EEL 5250 Power Systems Analysis – EEL 6936 Power Systems II
EEL 5935 Energy Delivery Systems – EEL 6936 Electrical Energy Distribution Systems
EEL 6502 Digital Signal Processing I – EEL 6752 Digital Signal Processing II
EEL 6426 RF/Microwave Circuits I – EEL 6427 RF/Microwave Circuits 2
Further examples may be found at:  http://ee.eng.usf.edu/Graduate/courseOptions.htm.

Environmental Engineering (EVE)
ENV 6002  3  Physical Chemical Principles
EES 6107  3  Biological Principles of Environmental Engineering
ENV 6666  3  Aquatic Chemistry

Plus one course from the following:
CGN 6933  3  Green Engineering for Sustainability or
CGN 6933  3  Green Infrastructure for Sustainable Communities or
ENV 6510  3  Sustainable Development Engineering

And six additional credits of coursework in Environmental Engineering or related areas (may include up to 6 credits of thesis).
Transportation Engineering (TPE)
TTE 5205 3 Traffic Systems Engineering
TTE 5501 3 Transportation Planning and Economics
TTE 6507 3 Travel Demand Modeling

And nine additional credits of coursework in Transportation Engineering or related areas (may include up to 6 credits of thesis and 4 credits of independent study).

Electives – 11 credit hours
11 additional credits of coursework may be taken either inside or outside the host department, with approval from the graduate program director of the host department.

Comprehensive Exam
Students in this program are required to meet a comprehensive exam requirement for graduation. This exam requirement can be met through one of the following, with the approval of the Graduate Program Coordinator of the host Department:

1) approval of a written thesis of a research project and successful oral defense of the thesis,
2) a comprehensive evaluation of a student portfolio of scholarly work (publications, major projects, etc.) or
3) successful completion of the FE (Fundamentals of Engineering Examination) offered by the National Council of Examiners for Engineering and Surveying.

Thesis Option
Students enroll in the thesis course that corresponds with the Concentration or Area of Study they are in.
CGN 6971 6 Thesis (Civil and Environmental Engineering)
CIS 6971 6 Thesis (Computer Science and Engineering)
ECH 6971 6 Thesis (Chemical and Biomedical Engineering)
EEL 6971 6 Thesis (Electrical Engineering)
EIN 6971 6 Thesis (Industrial and Management Systems Engineering)
EML 6971 6 Thesis (Mechanical Engineering)

COURSES
See http://ugs.usf.edu/course-inventory
ENGINEERING SCIENCE PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 72
Program Level: Doctoral
CIP Code: 14.0101
Dept. Code: DEA
Program (Major/College): EGC EN
Approved: 1973

CONTACT INFORMATION

College: Engineering
Department:
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

This program is designed to meet the needs of students who wish to pursue studies in interdisciplinary engineering areas.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
The student should have a strong background in scientific and engineering principles. At least one major professor in the College of Engineering should agree to guide the student by approving the admission.

DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 72 hours

The student’s Ph.D. program must meet University and College requirements (see main College of Engineering section), but is individually designed by the student’s two Co-Major Professors based on the student’s main areas of interest. While the student is hosted by a department, program approvals and the degree are authorized by the Co-Major Professors and the College of Engineering.

COURSES
See http://ugs.usf.edu/course-inventory
ENVIRONMENTAL ENGINEERING PROGRAM

Master of Environmental Engineering (M.E.V.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.1401
Dept. Code: EGX
Program (Major/College): EVE EN
Approved: 1997

CONTACT INFORMATION

College: Engineering
Department: Civil and Environmental Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The M.E.V.E. degree provides a student with the opportunity to earn the advanced degree by coursework only. Students must have an accredited first degree in engineering or complete a list of makeup engineering coursework.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
The field of Environmental Engineering has long been known for its breadth and ability to adapt to the new technological, societal, and global problems facing the environment. Major research areas include water quality engineering; air quality engineering; fate and transport of contaminants in the environment; environmental biotechnology and nanotechnology; waste management; sustainability and ecological engineering; surface water hydrology and hydraulics; and groundwater hydrology. Other focus areas include water reuse, green engineering, renewable energy, fate of emerging contaminants, and humanitarian engineering that has a developing world focus.

Graduates of the programs are prepared for careers with governmental agencies, nongovernmental organizations (NGOs), or private industry and firms involved in planning, design, research and development, or policy. The environmental engineering laboratories provide state-of-the-art analytical equipment for chemical and biological research. Equipment includes an ion chromatograph, atomic absorption spectrophotometer, several gas chromatographs, HPLC, ICPs, TOC machine, and environmental chambers. Field research sites are available locally and in several international settings that include developing world communities.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- Overall GPA 2.75; GPA in major 3.00
- GRE with preferred minimum scores of V 20%, Q 50%, AW 10% or valid fundamentals of engineering (FE) certificate preferred. Verification of FE certification should be obtained from the professional engineering (PE) board where the FE certification was obtained. See the CEE department website for more information: http://www2.eng.usf.edu/cee/graduate/apply.htm.
- TOEFL (international applicants only) 79 (550 paper-based exam) or 6.5 (IELTS)
- Two Letters of Reference
- Statement of Purpose
- Resume
- Exceptions made on a case-by-case basis where warranted.

http://www.eng.usf.edu/
DEGREE PROGRAM REQUIREMENTS

Total Program Minimum Hours

30 hours

The minimum coursework requirement for the Master of Engineering in Environmental Engineering degrees is 30 credit hours. No research thesis is required. All students must take four principles courses in physical/chemical principles; biological principles; aquatic chemistry, and sustainability and two environmental engineering process elective courses.

Core Courses (required)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV 6002</td>
<td>Physical Chemical Principles</td>
<td>3</td>
</tr>
<tr>
<td>EES 6107</td>
<td>Biological Principles of Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENV 6666</td>
<td>Aquatic Chemistry</td>
<td>3</td>
</tr>
<tr>
<td>And one of the following:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CGN 6933</td>
<td>Green Engineering for Sustainability or</td>
<td>3</td>
</tr>
<tr>
<td>CGN 6933</td>
<td>Green Infrastructure for Sustainable Communities) or</td>
<td>3</td>
</tr>
<tr>
<td>ENV 6510</td>
<td>Sustainable Development Engineering</td>
<td>3</td>
</tr>
</tbody>
</table>

Elective Courses (18 additional credits required, two courses must be from this list)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ENV 6519</td>
<td>Advanced Physical/Chemical Processes in Environmental Engineering</td>
<td>3</td>
</tr>
<tr>
<td>ENV 6667</td>
<td>Environmental Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>ENV 6105</td>
<td>Air Pollution Fundamentals</td>
<td>3</td>
</tr>
<tr>
<td>CGN 6933</td>
<td>Drinking Water Treatment Processes</td>
<td>3</td>
</tr>
<tr>
<td>ENV 6564</td>
<td>Environmental Engineering Design</td>
<td>3</td>
</tr>
<tr>
<td>ENV 6438</td>
<td>Phys &amp; Chemical Processes for Treatment of Drinking Water</td>
<td>3</td>
</tr>
</tbody>
</table>

Comprehensive Exam

Portfolio and oral interview are used in lieu of comps.

COURSES

See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
ENVIRONMENTAL ENGINEERING PROGRAM

Master of Science in Environmental Engineering (M.S.E.V.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
  Fall: February 15
  Spring: October 15
  Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.1401
Dept. Code: EGX
Program (Major/College): EVE EN
Approved: 1996

Contact Information

College: Engineering
Department: Civil and Environmental Engineering
Contact Information: www.grad.usf.edu

Concentration
Engineering for International Development (EFD)

PROGRAM INFORMATION

The M.S.E.V. degree provides a student with the opportunity to earn the advanced degree with coursework and a required research thesis. Students must have an accredited first degree in engineering or complete a list of makeup engineering coursework. A Engineering for International Development Concentration in Civil & Environmental Engineering allows students to combine their graduate education and research with engineering service in the Peace Corps. The M.S.E.V. is a research-oriented degree in which the student writes, as a major part of the degree requirements, a thesis that defines, examines and reports in depth on a subject area relevant to environmental engineering.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
The field of Environmental Engineering has long been known for its breadth and ability to adapt to the new technological, societal, and global problems facing the environment. Major research areas include water quality engineering; air quality engineering; fate and transport of contaminants in the environment; environmental biotechnology and nanotechnology; waste management; sustainability and ecological engineering; surface water hydrology and hydraulics; and groundwater hydrology. Other focus areas include water reuse, green engineering, renewable energy, fate of emerging contaminants, and humanitarian engineering that has a developing world focus.

Graduates of the programs are prepared for careers with academia, governmental agencies, nongovernmental organizations (NGOs), or private industry and firms involved in planning, design, research and development, or policy. The environmental engineering laboratories provide state-of-the-art analytical and experimental equipment for chemical and biological research. Equipment includes an ion chromatograph, atomic absorption spectrophotometer, several gas chromatographs, HPLC, ICPs, TOC machine, and environmental chambers. Field research sites are available locally and in several international settings that include developing world communities.
ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

• Overall GPA 2.75; GPA in major 3.00
• GRE with preferred minimum scores of V 20%, Q 50%, AW 10% or valid fundamentals of engineering (FE) certificate preferred. Verification of FE certification should be obtained from the professional engineering (PE) board where the FE certification was obtained. See the CEE department website for more information: http://www2.eng.usf.edu/cee/graduate/apply.htm.
• TOEFL (international applicants only) . 79 (550 paper-based exam) or 6.5 (IELTS)
• Two (2) Letters of Reference (EFD students must submit 3 letters of reference)
• Statement of Purpose
• Resume
• Exceptions made on a case-bay-case basis where warranted.

DEGREE PROGRAM REQUIREMENTS:

The programs consist of a minimum of 24 credit hours of coursework and 6 credit hours of thesis. All students must take four principles courses in physical/chemical principles; biological principles; aquatic chemistry, and sustainability.

Core Courses (required)

- ENV 6002 Physical Chemical Principles 3
- EES 6107 Biological Principles of Environmental Engineering 3
- ENV 6666 Aquatic Chemistry 3
- CGN 6933 Green Engineering for Sustainability or
- CGN 6933 Green Infrastructure for Sustainable Communities) or
- ENV 6510 Sustainable Development Engineering 3

Concentration Requirements 12

Engineering for International Development (EFD)

This concentration acknowledges course and international field experience in the area of engineering for international development that considers issues of sustainability, environment, health, gender, and society. Requires students take the following four courses that includes an extended international engineering field experience.

- ENV 6510 Sustainable Development Engineering

A minimum of 1 course (3 credits) from the following anthropology courses:
- ANG 6766 Research Methods in Applied Anthropology
- ANG 6730 Socio-cultural Aspects of HIV/AIDS
- ANG 6469 Health, Illness and Culture
- ANT 4930 Infectious Diseases

A minimum of 1 course (3 credits) from the following global public health courses:
- PHC 6764 Global Health Principles & Contemporary Issues
- PHC 6761 Global Health Assessment Strategies

3 additional credits of coursework in international development engineering or related areas

- CST 6990 For full-time global training and service in the U.S. Peace Corps as part of Engineering for International Development Concentration (0 credits)

Elective Courses – 12 credits

12 additional courses required based on approval of graduate committee. Students in the EFD Concentration complete the four required courses and the required concentration coursework, but are not required to take.
Comprehensive Exam
Thesis and defense are used in lieu of comps

Thesis – 6 hours
The six (6) these credits required for the degree are associated with research in a developing world context.

COURSES
See http://ugs.usf.edu/course-inventory
ENVIRONMENTAL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 48/78
Program Level: Doctoral
CIP Code: 14.1401
Dept. Code: EGX
Program (Major/College): ECE EN
Approved: 2013

CONTACT INFORMATION

College: Engineering
Department: Civil and Environmental Engineering
Contact Information: www.grad.usf.edu
Other Resources: www.usf4you.usf.edu

PROGRAM INFORMATION

The field of Environmental Engineering has long been known for its breadth and ability to adapt to the new technological, societal, and global problems facing the environment. Major research areas include water quality engineering; air quality engineering; fate and transport of contaminants in the environment; environmental biotechnology and nanotechnology; waste management; sustainability and ecological engineering. Other focus areas include water reuse, green engineering, renewable energy, fate of emerging contaminants, and humanitarian engineering that has a developing world focus. Graduates of the program are prepared for careers in academia, governmental agencies, nongovernmental organizations (NGOs), or private industry and firms involved in planning, design, research and development, or policy.

The environmental engineering laboratories provide state-of-the-art analytical and experimental equipment for chemical and biological research. Equipment includes an ion chromatograph, atomic absorption spectrophotometer, several gas chromatographs, HPLC, ICPs, TOC machine, and environmental chambers. Field research sites are available locally and in several international settings that include developing world communities.

The Ph.D. degree is awarded in recognition of demonstrated scholarly competence and ability to conduct and report original and significant research in Environmental Engineering.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

Major Research Areas:
Contact Program for information.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- GRE with preferred minimum scores of V45%, Q 65%, AW 50%.
- TOEFL (International applicants only) 79 (550 paper based exam) or 6.5 (IELTS).
- Resume.
- Three (3) letters of reference.
- Statement of Purpose.
DEGREE PROGRAM REQUIREMENTS:

Total Program Hours:
- For students with an approved master’s degree: 48 hours minimum
- For students without a master’s degree: 78 hours minimum

Coursework requirements:
- 49 hours
- CGN 6945 Graduate Research Methods (1 credit)
- ENV 6002 Physical & Chemical Principles in Environmental Engineering
- EES 6107 Biological Principles
- ENV 6666 Aquatic Chemistry
- 1 course (3 credits) from the following list of sustainability courses:
  - CGN 6933 Green Engineering for Sustainability
  - CGN 6933 Green Infrastructure for Sustainable Communities
  - ENV 6510 Sustainable Development Engineering
- 33 additional credits of coursework in Environmental Engineering or related areas

Up to 30 credits of coursework from an approved master’s degree may be applied to meet the coursework requirements.

Qualifying Exam
Doctoral students are expected to pass a qualifying examination no later than the semester following the completion of 48 credits of coursework beyond a bachelor’s degree. At minimum, the Exam will include a written dissertation proposal and oral defense by the Dissertation Committee. A written exam in the area of concentration may also be required. Poor performance on the Qualifying Exam based on the judgment of the Committee may result in the student failing the exam. If a student does not pass on the first attempt, he/she may request in writing to repeat the Exam. Students who fail the Qualifying Examination the second time will be dismissed by the Program.

Dissertation Requirements:
- 20 hours minimum
- CGN 7980 Dissertation (20 hours minimum)

Additional Requirements:
- 9 hours minimum
Nine (9) credits of additional coursework, graduate instruction methods, dissertation, or directed research are required.

Publication Requirement
Students must have at least one paper accepted to a peer reviewed journal or peer reviewed conference based on their research carried out during their doctoral studies at USF.

COURSES
See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
INDUSTRIAL ENGINEERING PROGRAM

Master of Science in Industrial Engineering (M.S.I.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.3501
Dept. Code: EGX
Program (Major/College): EVE EN
Approved: 1981

CONTACT INFORMATION

College: Engineering
Department: Industrial and Management Systems Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The department participates in the College’s M.S.E. programs. The department offers advanced degrees in areas of study pertinent to the design, evaluation, and operation of a variety of industrial systems, ranging from the analysis of public systems, to the service industry, to the operation of manufacturing concerns. Course topics and research opportunities include engineering analytics, production planning, production control, facilities design, applied engineering statistics, quality control and reliability, operations research, engineering economic analysis, human factors engineering, productivity analysis, manufacturing systems, robotics, automation, and computer applications. The department has advanced laboratory facilities that support class projects and research in microcomputer applications, computer-aided design and manufacturing, flexible automation, quality control, and applications in robotics.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- An undergraduate degree in Industrial Engineering or a related field with a strong background in mathematics with a 3.00/4.00 GPA; non engineering degrees will be required to take supplemental undergraduate courses
- GRE Required
- TOEFL for international students 213 (550 paper version)
- Three letters of reference
- Statement of purpose including evidence of research potential
DEGREE PROGRAM REQUIREMENTS

Total Minimum Hours: 30 credit hours

Thesis option: minimum of 24 credit hours of approved course work, including three core courses and five IE elective courses, and six credit hours of thesis.

Non-thesis option: minimum of 30 credit hours of approved course work, including three core courses, five IE elective courses, and two general elective courses.

Required Core Courses: 9 credit hours

- ESI 6410 Optimization in Operations Research 3
- ESI 6247 Statistical Design Models 3
- ESI 6340 Probabilistic Systems Analysis 3

IE Elective Courses: 15 credit hours

- ESI 4333 Production Control 3
- ESI 4221 Industrial Statistics & Quality Control 3
- EIN 4364 Facilities Design 3
- EIN 5350 Technology & Finance 3
- ESI 5522 Computer Simulation 3
- ESI 5236 Reliability Engineering 3
- ESI 5306 OR for Engineering Management 3
- EIN 6145 Project Management 3
- EIN 6935 Lean Six Sigma 3
- ESI 6324 Engineering the Supply Chain 3
- EIN 6336 Production Control Systems 3
- ESI 6448 Integer Programming 3
- EIN 6396 Nonlinear Programming 3
- ESI 6447 Large-scale Optimization 3
- EIN 6319 Work Design & Productivity 3
- EIN 6112 Information Systems Design 3
- EIN 6934 Engineering Analytics I 3
- EIN 6934 Engineering Analytics II 3
- EIN 6608 Advanced Analytics I 3
- EIN 6609 Advanced Analytics II 3

General Elective Courses

Any College of Engineering 5000+ level course, including IMSE courses, except for the courses listed as IE elective courses above. Examples include:

- EIN 5182 Principles of Engineering Management 3
- EIN 6386 Management of Technological Change 3
- EIN 6934 Systems Integration 3
- EIN 6936 Advanced Lean Six Sigma 3
- EIN 6178 ISO 9000/14000 3
- EIN 6179 Advanced TQM Methods. 3

In addition, students can choose electives from other department and/or non-departmental courses, with the approval of major advisor or program director. Contact the department for information. Also visit http://imse.eng.usf.edu

Thesis 6 credit hours

COURSES
See http://ugs.usf.edu/course-inventory
INDUSTRIAL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 90

Program Level: Doctoral

CIP Code: 14.3501

Dept. Code: EGS

Program (Major/College): EIE EN

Approved: 1983

CONTACT INFORMATION

College: Engineering
Department: Industrial and Management Systems Engineering

Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

Contact the department for information, http://imse.eng.usf.edu/academics/phd.asp.

Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
Although USF only requires Ph.D. students to complete two consecutive semesters as full-time students, the IMSE Dept. policy is for Ph.D. students to complete their total doctoral program as full-time Tampa campus students. Other requirements include:

- GRE Required
- TOEFL for international students 213 (550 paper version)
- Three letters of reference
- Statement of Purpose including evidence of research potential

DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 90 hours post bachelor’s

Minimum of 90 credit hours beyond BS degree. Minimum of 60 credit hours of approved course work and 20 credit hours of dissertation research. Total hours of credit must equal or exceed 90 hours. Contact the department for additional information.

Must have 2 (at least one accepted, the other submitted) referred journal publications before graduation.
USF Graduate Catalog 2015-2016

Industrial Engineering (Ph.D.)

Must take the following 4 core courses:

**Required Core Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESI 6213</td>
<td>Stochastic Decision Models I</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6935</td>
<td>Systems Modeling and Performance Analysis</td>
<td>3</td>
</tr>
<tr>
<td>ESI 6245</td>
<td>Advanced Statistical Design Models</td>
<td>3</td>
</tr>
<tr>
<td>ESI 6491</td>
<td>Linear Programming and Network Optimization</td>
<td>3</td>
</tr>
</tbody>
</table>

In addition a minimum of 8 hours of mathematics or statistics is required (the choice of such courses must be approved by the student’s doctoral committee). Further requirements may be imposed by the candidate’s committee.

**Elective Courses**

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>ESI 5522</td>
<td>Computer Simulation</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6119</td>
<td>Decision Support Systems</td>
<td>3</td>
</tr>
<tr>
<td>ESI 6324</td>
<td>Engineering the Supply Chain</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6433</td>
<td>Human Factors in Engineering Medical Devices</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6112</td>
<td>Information Systems Design</td>
<td>3</td>
</tr>
<tr>
<td>ESI 6448</td>
<td>Integer Programming</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6435</td>
<td>International Regs for Med Devices</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6386</td>
<td>Management of Technology Change</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6420</td>
<td>Non-Linear Programming</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6336</td>
<td>Production Control Systems</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6145</td>
<td>Project Management</td>
<td>3</td>
</tr>
<tr>
<td>ESI 5236</td>
<td>Reliability Engineering</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6319</td>
<td>Work Design and Productivity</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6608</td>
<td>Advanced Analytics I</td>
<td>3</td>
</tr>
<tr>
<td>EIN 6609</td>
<td>Advanced Analytics II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Directed Research**

9 hours

**Dissertation**

11 hours

In addition, students may choose electives from other department and/or non-departmental courses, with the approval of major advisor or program director. Contact the department for information. Also visit [http://imse.eng.usf.edu](http://imse.eng.usf.edu)

**COURSES**

See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
INFORMATION TECHNOLOGY PROGRAM

Master of Science in Information Technology (M.S.I.T.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
Domestic Applications:
Fall Semester: February 15
Spring Semester: October 15
Summer: No admit

International Students in the US:
Fall: February 15
Spring: October 15
Summer: No admit

International Students outside the US:
Fall: January 15
Spring: September 15
Summer: No admit

Minimum Total Hours: 30 (non-thesis)

Program Level: Masters
CIP Code: 11.0103
Dept Code: EIT
Program (Major/College): ITC / EN
Approved: Spring 2014

CONTACT INFORMATION

College: Engineering
Department: Computer Science and Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

Program Description

The Department of Computer Science and Engineering offers a non-thesis option for the degree of Master of Science in Information Technology (M.S.I.T.). The MSIT graduate will demonstrate strong information technology skills as well as problem solving skills needed for the deployment of technology solutions to achieve business and organizational goals. The degree is available in an online mode, and provides students with a broad and integrative understanding of both technology and operational and strategic business and organizational applications. There is considerable freedom in the choice of the courses.

The breadth of subjects which are part of information technology together with the immense diversity of its applications, make it imperative that students in the Master’s program maintain close contact with the Graduate Program Director, in order to achieve a coherent plan of study directed towards a specific goal. In particular, selection of courses should only be made with prior consultation and approval of the Major Professor or the Graduate Program Director.

Accreditation: Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSIONS INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.
Program Admission Requirements

- The GRE is required for all MSIT applicants. For GRE tests taken after August 1, 2011, we require a minimum of 161 on the Quantitative portion (81 percentile) and a minimum of 150 (44 percentile) on the Verbal. The GRE will be waived for M.S. degree applicants with an undergraduate degree from an ABET-accredited United States university.
- Minimum grade point average (GPA) of “B” (or equivalent) for all coursework completed during the last two years of undergraduate program.
- Submission of TOEFL scores with an Internet-based score of 79 or higher for applicants from non-English speaking countries. If consideration of an assistantship is desired, the speaking score component of the TOEFL must be 26 or above. The TOEFL requirements for admission may be waived if the applicant meets one of the following conditions:
  - Has scored 500 or higher on the GRE Verbal Test, (Old Scores) or 153 with the New GRE scoring.
  - Has earned a college degree at a U.S. institution of higher learning.
  - Has earned a college degree from an institution whose language of instruction is English, (must be noted on the transcript).
  - Has scored 6.5 on International English Language Testing System, (IELTS).
- Three letters of recommendation.
- Statement of purpose.
- Bachelor’s Degree in Information Technology, Computer Science, or a closely related field; or a bachelor’s degree in another field, plus satisfactory completion of the courses listed below under “Undergraduate Prerequisites.”
- Evidence of completion of a defined subset of the required core courses found in the University of South Florida’s Bachelor of Science in Information Technology degree program or their equivalent (see “Undergraduate Prerequisites” below).

Undergraduate Prerequisites
To be successful in this program, an applicant should have certain base knowledge in the discipline demonstrated from undergraduate-level pre-requisite courses including:

- COP2224/2931  Object-Oriented Programming
- COP2510/2930  Programming Concepts
- COP 3515  IT Program Design
- CEN 4031  IT Software Engineering
- COP 4703  IT Database Systems
- EEL 4854  IT Data Structures & Algorithms

The student should have taken these courses or their equivalent prior to beginning graduate coursework. All prerequisite courses are available online. In some cases, applicants lacking some of the prerequisites may be conditionally admitted to the MSIT program; such students will be required to complete missing prerequisites within the first year of graduate study.

Professional experience in information technology is typically focused on specific projects or systems, and is not as broad as the treatment of a topic one receives in a course. Therefore, except in unusual circumstances, professional experience cannot substitute for any of the above prerequisite courses.

DEGREE PROGRAM REQUIREMENTS

Total Minimum Hours: 30 hours

Core Requirements – 12 hours

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Hours</th>
<th>Course Title</th>
</tr>
</thead>
<tbody>
<tr>
<td>CNT 6008</td>
<td>3</td>
<td>Network Programming for IT</td>
</tr>
<tr>
<td>ISM 6218</td>
<td>3</td>
<td>Advanced Database Administration</td>
</tr>
<tr>
<td>CGS 6425</td>
<td>3</td>
<td>Advanced Programming</td>
</tr>
<tr>
<td>CAP 6940</td>
<td>3</td>
<td>IT Graduate Practicum</td>
</tr>
</tbody>
</table>
Elective Courses – 18 hours
Select six of the following courses, or other graduate course as approved by the Graduate Program Director:

- CAP 6011 3 Multimedia & E-Commerce for IT
- ENG 6025 3 RFID and NFC Technologies for IT
- CAP 6033 3 Information Security Architecture for IT
- ISM 6136 3 Data Mining
- ISM 6137 3 Statistical Data Mining
- ISM 6145 3 Seminar on Software Testing
- ISM 6155 3 Enterprise Information Systems Management
- ISM 6266 3 Software Architecture
- CAP 6663 3 IT Robotics Applications
- CAP 6671 3 IT Intelligent Agents
- CGS 6842 3 IT & Systems for E-Business

Note: ISM prefix courses are offered by the Department of Information Systems / Decision Sciences (College of Business).

Comprehensive Exam
The requirement for a comprehensive exam is satisfied by the successful completion of the IT Graduate Practicum (CAP6940) as described below.

Thesis / Non-Thesis
This is a non-thesis program. However, the required three semester hour IT Graduate Practicum (CAP 6940) serves as a comprehensive measure of student competency in the discipline. This practicum, to be taken over one or two semesters, requires satisfactory completion, as determined by a faculty panel consisting of faculty members and/or industrial supervisor, of a major development effort on a real-world scenario, capped by a formal presentation for faculty and other students. Upon completion of the practicum project, the student will submit a formal project report, including all written deliverables. A formal oral presentation will be made to a panel of faculty members and the industrial supervisor, if applicable, who will provide their evaluation of the presentation and project report to the student’s IT Graduate Practicum Faculty Advisor.

COURSE DESCRIPTIONS

See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
MATERIALS SCIENCE AND ENGINEERING PROGRAM

Master of Science in Materials Science and Engineering (M.S.M.S.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15
Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.1801
Dept. Code: All Engineering Depts. except Computer Science and Engineering
Program (Major/College): MSE
Approved: 2001

CONTACT INFORMATION

Colleges: Engineering
Departments: Chemical & Biomedical Eng, Civil Engineering, Electrical Engineering, Industrial Engineering, Mechanical Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The field of Materials Science and Engineering (MSE) applies the fundamental principles of physics and chemistry to engineering materials, with a focus on the interrelationship between material structure, their properties, and the means by which they are processed. MSE impacts multiple facets of our economy, such as aerospace, electronics, transportation, communication, construction, recreation, environment and energy. It is, by its very nature, an interdisciplinary field. The goal of the M.S.M.S.E. program in Materials Science and Engineering is to provide a route for well-qualified undergraduate students who desire in-depth graduate-level work including structured courses and research experience, in preparation for work in industry or for entrance into a relevant science or engineering Ph.D. program.

Accreditation:
 Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- Bachelor’s degree in Engineering (Chemical, Mechanical, Industrial, Civil, Materials Science, Ceramic, Metallurgy, Manufacturing, Polymer and other related engineering disciplines) or Natural Sciences (Physics, Chemistry or Biology) from a regionally accredited institution.
- Minimum undergraduate GPA of 3.00
- GRE with preferred minimum scores of V 50%, Q 50% and AW 50%.
- TOEFL score of 550 (paper-based test) or 213 (computer-based test) or 79 (internet-based test) for international students
- Three letters of recommendation
- Statement of purpose
## DEGREE PROGRAM REQUIREMENTS

**Total Minimum Program Hours:** 30 credit hours

### Core Requirements
5 credit hours

- EMA 6510 Characterization of Materials 3
- ECH 6931 Graduate Seminar or PHY 6938 Graduate Seminar 2

### Electives
19 credit hours minimum

**Comprehensive Exam is not required.**

### Thesis Option
6 credit hours

The thesis option requires the completion of 24 credit hours of graduate level courses (5 credit hours core and 19 hours of electives) and 6 credit hours of thesis. At least 16 credit hours must be at 6000 level with a maximum of 2 hours of Independent Study.

- XXX 6971 Thesis

### Non-Thesis Option:
6 credit hours

The non-thesis option requires 30 credit hours, with 5 credit hours core and 25 credit hours of electives. At least 26 hours must be at the 6000 level with a maximum of 2 hours of Independent Study. For Non-thesis Option six additional credit hours of elective courses is required in lieu of thesis hours.

### Courses
See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
MECHANICAL ENGINEERING PROGRAM

Master of Mechanical Engineering (M.M.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: ---

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.1901
Dept. Code: EGR
Program (Major/College): EME EN
Approved: 1994

PROGRAM INFORMATION

The Department offers graduate programs leading to the M.S. and Ph.D. in Mechanical Engineering.


Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- As a rule, only students with a B.S. in Mechanical Engineering or a closely related field from an accredited engineering program will be considered for admission.
- All applicants must take the GRE.
- GRE required, with minimum percentile rank of 50% on the quantitative portion and a minimum average percentile rank of 50% in verbal and quantitative OR the student must have a grade point average (GPA) of 3.00/4.00 for the last two years of coursework from an ABET accredited engineering program for admission to the Master’s Program.
- International students must score a minimum of 550 on the TOEFL paper-based examination, 79 on the internet-based test, or 213 on the computer-based test.
- A one-page Statement of Purpose must also be included in the application package.
DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 30 credit hours

Core Requirements – 12 credit hours
All Master’s Program students must complete a total of 12 core credit hours from two categories.

**Fluid and Thermal Science - 6 credit hours**
- EML 6105: Advanced Thermodynamics and Statistical Mechanics
- EML 6154: Advanced Conduction Analysis
- EML 6713: Advanced Fluid Mechanics
- EML 6930: Convection Heat Transfer

**Mechanics and Systems - 6 credit hours**
- EML 6223: Synthesis of Vibrating Systems
- EML 6273: Advanced Dynamics of Machinery
- EML 6653: Applied Elasticity
- EML 6930: Failure Mechanisms in Materials
- EML 6930: Advanced Materials
- EML 6570: Fracture Mechanics
- EML 6930: Engineering Design Principles and Practices

EML 6931: Advanced Mathematics or EML 6930: Advanced Mathematics II may be taken in lieu of one of the classes named above in order to satisfy a core requirement.

**Additional Coursework – 18 credit hours**
In addition to the 12 core credit hours, the MME degree requires a minimum of 18 credit hours of approved coursework, for a total of 30 semester hours.

**Comprehensive Exam**
MME students must also pass a final Comprehensive Oral Examination.

The Department of Mechanical Engineering has available, on request, the Mechanical Engineering Graduate Program Handbook, which delineates the Department’s entrance requirements, programs of study, supervisory committee formation, and program completion requirements. The M.M.E is a non-thesis program and the M.S.M.E is a thesis program.

**COURSES**
See [http://ugs.usf.edu/course-inventory](http://ugs.usf.edu/course-inventory)
MECHANICAL ENGINEERING PROGRAM

Master of Science in Mechanical Engineering (M.S.M.E.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 30
Program Level: Masters
CIP Code: 14.1901
Dept. Code: EGR
Program (Major/College): EME EN
Approved: 1981

CONTACT INFORMATION

College: Engineering
Department: Mechanical Engineering
Contact Information: www.grad.usf.edu

PROGRAM INFORMATION

The Department offers graduate programs leading to the M.S. and Ph.D. in Mechanical Engineering.


Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements
- As a rule, only students with a B.S. in Mechanical Engineering or a closely related field from an accredited engineering program will be considered for admission.
- All applicants must take the GRE.
- GRE required, with minimum percentile rank of 50% on the quantitative portion and a minimum average percentile rank of 50% in verbal and quantitative OR the student must have a grade point average (GPA) of 3.00/4.00 for the last two years of coursework from an ABET accredited engineering program for admission to the Master’s Program.
- International students must score a minimum of 550 on the TOEFL paper-based examination, 79 on the internet-based test, or 213 on the computer-based test.
- A one-page Statement of Purpose/Research Interest must also be included in the application package.
DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 30 credit hours

All Master’s Program students must complete a total of 12 core credit hours from two categories. Students should choose 6 credit hours of course work from the following category:

Fluid and Thermal Science 6 credit hours
EML 6105: Advanced Thermodynamics and Statistical Mechanics
EML 6154: Advanced Conduction Analysis
EML 6713: Advanced Fluid Mechanics
EML 6930: Convection Heat Transfer

Students should choose 6 credit hours of course work from the following category:

Mechanics and Systems 6 credit hours
EML 6223: Synthesis of Vibrating Systems
EML 6273: Advanced Dynamics of Machinery
EML 6653: Applied Elasticity
EML 6930: Failure Mechanisms in Materials
EML 6930: Advanced Materials
EML 6570: Fracture Mechanics
EML 6930: Engineering Design Principles and Practices

EML 6931: Advanced Mathematics or EML 6930: Advanced Mathematics II may be taken in lieu of one of the classes named above in order to satisfy a core requirement.

Additional Coursework 12 credit hours
In addition to these 12 credit hours, the MSME degree requires a minimum of 12 credit hours of approved coursework and a minimum of 6 thesis hours for a total of 30 semester hours. MSME students must present a typed final draft to the Supervisory Committee and Graduate Advisor one week before the final oral examination.

Comprehensive Exam
A student must pass the final Oral Comprehensive Examination after the student has presented his/her thesis to the Supervisory Committee.

Thesis 6 credit hours
EML 6971 Thesis: Master’s

The Department of Mechanical Engineering has available, on request, the Mechanical Engineering Graduate Program Handbook, which delineates the Department’s entrance requirements, programs of study, supervisory committee formation, and program completion requirements. The M.M.E. is a non-thesis program and the M.S.M.E. is a thesis program.

COURSES
See http://ugs.usf.edu/course-inventory
MECHANICAL ENGINEERING PROGRAM

Doctor of Philosophy (Ph.D.) Degree

DEGREE INFORMATION

Program Admission Deadlines:
- Fall: February 15
- Spring: October 15
- Summer: February 15

Minimum Total Hours: 72
Program Level: Doctoral
CIP Code: 14.1901
Dept. Code: EGR
Program (Major/College): EME EN
Approved: 1982

Concentrations:
- Manufacturing (MFG)

PROGRAM INFORMATION

The Department offers graduate programs leading to the M.S. and Ph.D. in Mechanical Engineering.


Accreditation:
Accredited by the Commission on Colleges of the Southern Association of College and Schools.

ADMISSION INFORMATION

Must meet University requirements (see Graduate Admissions) as well as requirements listed below.

Program Admission Requirements

- As a rule only students with an M.S. in Mechanical Engineering or a closely related field will be admitted into the Ph.D. Program.
- Students without an M.S. in Mechanical Engineering may also be admitted but will be required to take
  - a minimum of 6 credit hours from the Fluid and Thermal Sciences area and
  - a minimum of 6 credit hours from the Mechanics and Systems area.
- GRE required, with minimum percentile rank of 60% on the quantitative portion and a minimum average percentile rank of 60% in verbal and quantitative OR the student must have a grade point average (GPA) of 3.00/4.00 for the last two years of coursework from an ABET accredited engineering program for admission to the PhD Program.
International students must score a minimum of 550 on the TOEFL paper-based examination, 79 on the internet-based test, or 213 on the computer-based test.

- A one-page Statement of Purpose/Research Interest must also be included in the application package.

DEGREE PROGRAM REQUIREMENTS

Total Minimum Program Hours: 72 credit hours (post-bacc)

Core – 12 credit hours
- Math req – 6 credit hours
- Coursework – 18 credit hours
- Dissertation – 20 credit hours
- Additional coursework or dissertation – 16 credit hours

A minimum of 72 credit hours beyond the baccalaureate degree, of which there must be a minimum of 36 hours of coursework at the 6000 level without counting Independent Study or Special Topics courses and a minimum of 20 hours of dissertation. A minimum of 18 hours of coursework is required in the student's area of specialization and there must be at least 6 hours of mathematics or statistics and 6 hours of coursework outside the major area of specialization. All students are required to fulfill the 12 credit hours of core course requirements as outlined below. Courses completed for a Master's degree from another institution may count towards a maximum of 24 credit hours of coursework for the Ph.D. degree only if the transcript shows that the degree requirements were similar to USF and the student did not already get credit for the identical courses at USF. A qualifying examination must be passed before admission to doctoral candidacy.

Core Requirements 12 credit hours

All Ph.D. Program students must complete a total of 12 core credit hours from two categories.

Fluid and Thermal Science 6 credit hours
- EML 6105: Advanced Thermodynamics and Statistical Mechanics
- EML 6154: Advanced Conduction Analysis
- EML 6713: Advanced Fluid Mechanics
- EML 6930: Convection Heat Transfer

Mechanics and Systems 6 credit hours
- EML 6223: Synthesis of Vibrating Systems
- EML 6273: Advanced Dynamics of Machinery
- EML 6653: Applied Elasticity
- EML 6930: Failure Mechanisms in Materials
- EML 6930: Advanced Materials
- EML 6570: Fracture Mechanics
- EML 6930: Engineering Design Principles and Practices

Mathematics Requirement 6 credit hours
- EML 6931: Advanced Mathematics
- EML 6930: Advanced Mathematics II

Additional Coursework 18 credit hours minimum

Qualifying Examination

The purpose of the Qualifying Examination is to determine if the student has acquired sufficient mastery of the subject matter in all relevant fields on his/her program of study to warrant admission to candidacy for the Ph. D. degree. It should be taken as soon as a student has completed a major portion of the coursework requirements. Students must apply to take the qualifying examination no later than the fourth semester after admission into the doctoral program. In order to take the qualifying examination a doctoral student must satisfy the following requirements:

http://www.eng.usf.edu/
1. Satisfactorily complete (C or better) in departmental coursework on Mathematics and two other areas of specialization (1 major and 1 minor) as described below.

   a) Mathematics:
      a. Graduate courses - Advanced Mathematics, Advanced Mathematics II
   b) Heat Transfer:
      a. Undergraduate courses - Heat Transfer
      b. Graduate courses - Conduction Heat Transfer, Convection Heat Transfer
   c) Fluid Mechanics:
      a. Undergraduate courses – Fluid Systems
      b. Graduate courses - Advanced Fluids
   d) Thermodynamics:
      a. Undergraduate courses – Thermo I, Thermal Systems
      b. Graduate courses - Advanced Thermodynamics
   e) Dynamics:
      a. Undergraduate courses – Dynamics, Vibrations, Kinematics and Dynamics of Machinery
      b. Graduate courses - Advanced Dynamics of Machinery, Synthesis of Vibrating Systems
   f) Solid Mechanics:
      a. Undergraduate courses – Mechanics of Solids, Machine Design
      b. Graduate Courses - Applied Elasticity
   g) Materials:
      a. Undergraduate courses – Materials I
      b. Graduate courses - Advanced Materials

2. Apply in writing to the Graduate Coordinator for permission to take the examination. The application must include a detailed statement of the courses taken, major and minor areas of specialization and must be submitted before October 15th.

3. Students may request an exemption from any required coursework if they have satisfactorily completed (B or better) equivalent coursework at an accredited institution other than USF.

No student will be allowed to take the examination if the cumulative GPA of all courses taken at USF is below 3.0, have not chosen a major professor and formed a supervisory committee, or is holding conditional or provisional admission status in the program.

The examination will be administered by a Departmental Qualifying Examination Committee once a year (in the first two weeks of February), as needed.

1. Written Examination
   a. Examinations will be given on Mathematics, and student’s chosen major and minor areas of specialization. Examinations will be prepared by the qualifying examination committee and will be administered by the graduate coordinator. Composition of the committee will be rotated among all faculty members and determined by the exam areas to be offered. If at all possible, a Ph.D. advisor will not be involved in the evaluation of her/his students. The length of each examination will be approximately three hours of duration.
   b. The type of written examination, i.e., open book etc., is at the discretion of the assessor.

2. Passing and Advancement to Candidacy
   a. A student is required to pass the written examination in all 3 areas (Mathematics, major area of specialization, minor area of specialization) for advancement to candidacy.
   b. In case a student passes in 2 areas and fails in 1 area, a make-up written or oral examination may be requested by the student. The make-up examination will be given during the last two weeks of March.
   c. In case a student fails the written examination in more than one area or fails the written or oral make-up examination, he or she will need to re-take the entire qualifying examination in the following year.
   d. Students will be given a maximum of two attempts to pass the qualifying examination. Failure in the second year will result in being dropped from the doctoral program.
Dissertation 20 credit hours minimum

Additional Coursework or Dissertation 16 credit hours
Students will select additional coursework or Dissertation hours to complete the remaining 16 credit hours.

The Department of Mechanical Engineering has available, on request, the Mechanical Engineering Graduate Program Handbook, which delineates the Department’s entrance requirements, programs of study, supervisory committee formation, and program completion requirements.

COURSES
See http://ugs.usf.edu/course-inventory