

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2017-2018 UNDERGRADUATE CATALOG

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OUR MISSION

To profoundly shape and impact lives through the steadfast pursuit of world-class engineering research, education, and innovation.

OUR VISION

We aspire to be at the forefront of engineering research and education, cultivating knowledgeable, passionate engineers who are dedicated to need-based, solutions-oriented engineering.

OUR VALUES

We share a culture of excellence, characterized by an emphasis on students, research, innovation, partnership, inclusivity, agility, and the future.

DEPARTMENTS AND PROGRAMS

The College of Engineering offers undergraduate and graduate programs to prepare students for a broad spectrum of professional careers in engineering. Laboratory experiences, as well as real-world participation in technological problem solving, are key aspects of a professional engineer's education. The laboratory and research facilities of the College of Engineering, close collaboration with engineering professional societies and the many industries in the metropolitan Tampa Bay area provide a wide range of experiential learning opportunities for engineering students at the University of South Florida. The College of Engineering offers undergraduate degrees in Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Industrial Engineering, Information Technology, and Mechanical Engineering. In addition, the College offers minors in Biomedical Engineering, Computer Science, and Information Technology. The engineering programs of the College have been developed with an emphasis on three broad aspects of engineering activity: design, research, and the operation of complex technological systems. The undergraduate degree programs provide a strong, broad-based, fundamental engineering education as preparation for careers in industry and government, or as preparation for advanced studies in professional schools of engineering, science, law, business, and medicine.

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. Students who are interested in advanced design or research should pursue a traditional or accelerated (5-Year) program leading to a Master of Science degree in the designated discipline. The supervision of the academic programs is the function of the administrative departments together with several coordinators. Each department is responsible for specific professional programs, faculty, laboratories, and student advising.

The Departments and Programs section that follows contains descriptions of the baccalaureate degrees offered by the College. Students interested in particular programs offered by the College of Engineering should direct their inquiries to the College of Engineering's Office of Student Services. Information is also available on the College's website: <http://www.usf.edu/engineering/>.

Accreditation

The USF Bachelor of Science degree programs in Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Industrial Engineering, and Mechanical Engineering are accredited by the Engineering Accreditation Commission of ABET. The Bachelor of Science degree program in Computer Science is accredited by the Computing Accreditation Commission of ABET www.abet.org.

Admission Requirements

Admission Requirements for First Time in College Students for All Engineering Majors and for the Computer Science Major

(Excludes Admission Requirements for the Information Technology Major – see below)

First time in college students and lower division students with 30 credits or less, who meet the criteria below, are granted direct entry into the College of Engineering:

1. Admitted to the University of South Florida as a degree seeking student;
2. Test Scores:
 - o SATM-a minimum quantitative score of 550 **or**
 - o ACTM-a minimum score of 24 **or**
 - o Completed College Algebra with a grade of C or better (not C-) **or**
 - o Take College Algebra at USF before the first fall semester and get a grade of C or better (not C-).

Those students who do not meet the above criteria can be admitted to the College after satisfactorily completing Calculus I and II and Physics I with lab, all with a minimum grade of C or better (no C-) in no more than two (2) attempts per course while at USF. Two attempts includes withdrawal from a course.

Additional requirements must be met prior to admission to specific degree programs.

Admission Requirements for Transfer Students for All Engineering Majors and for the Computer Science Major

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(Excludes Admission Requirements for the Information Technology Major – see below)

1. Fully admitted to the University of South Florida as a degree-seeking student with more than 30 earned credits.
2. Transfer students must complete all of the following courses with a grade of C or better (no C-) in each course (maximum two {2} attempts allowed to earn required grade and a withdrawal is considered an attempt):
 - o Calculus I (MAC X281 or MAC X311 or equivalent)
 - o Calculus II (MAC X282 or MAC X312 or equivalent), and
 - o Calculus-based Physics I plus lab (PHY X048L or PHY X045L)

If a student does not meet these admissions requirements, the student can attempt to meet these transfer admission requirements in no more than two (2) attempts per course while at USF. If a grade of C is not attained in each of these courses in two or less attempts, the student will be redirected to another major.

For the specific state mandated common prerequisite courses for each major within the College of Engineering, please see the section entitled, "State Mandated Common Prerequisites" located in each department's section of the catalog.

3. Florida College System transfer students who have met the minimum criteria above and have completed the prerequisites required for their major with the minimum grades and GPA required by the academic department are accepted directly into the College of Engineering and into the specific program/major.

The USF College of Engineering will accept transfer credit from non-Florida Statewide Common Course Numbering System courses when appropriate if the transferred course has been passed with a grade of C or better and it is determined to be equivalent in both content and quality. In some cases credit for a course *may* be granted, but the hours accepted may be less than the hours earned at another school. In general, engineering and technology courses taken at technical schools, or as part of professional or military training, are not applicable to the degree programs of the College of Engineering. Transfer students should be prepared to submit detailed course syllabi from the previous institution if requested.

While credit work from other institutions may be granted subject to the conditions of the previous paragraph, at least 30 credit hours including a minimum number of semester hours of engineering coursework, specified by the degree-granting department, must be taken at USF to receive the baccalaureate degree. Prospective transfer students may contact the College's Office of Student Services at (813) 974-2684 to request an assessment.

Admission Requirements for First Time in College Students applying to the Information Technology Major

Admitted to the University of South Florida as a degree-seeking student. Please note: These admission requirements do not apply to any other College of Engineering undergraduate major.

Transfer Admission Requirements for the Information Technology Major

For the specific state mandated common prerequisite courses for the Information Technology major, please see the section entitled, "State Mandated Common Course Prerequisites" located in the Information Technology major.

College-Level Requirements

GENERAL INFORMATION

Engineering Today and Tomorrow

The College of Engineering recognizes that modern engineering solutions draw on knowledge of several branches of engineering. It also recognizes that future technological and societal developments will lead to shifting the relative emphasis on various branches of engineering, triggered by new needs or a reassessment of national goals. For this reason, the College's programs include a strong engineering foundation, designed to equip the graduating engineer with a broad base of fundamental technical knowledge and specialization course work in sufficient depth to embark upon a successful professional career.

The Bachelor of Science degrees offered in the various engineering disciplines provide the student a broad education with sufficient technical background to contribute effectively in many phases of engineering not requiring the depth of knowledge needed for advanced design or research. The baccalaureate degree is considered the minimum educational credential in the engineering profession. Students interested in design and in research are strongly encouraged to pursue advanced work beyond the baccalaureate at this or other institutions. Today's engineering and technology professionals value and participate in post baccalaureate study to obtain the information and training necessary to effectively meet tomorrow's technological challenges. In order to keep abreast of evolving technologies continuing education is available through formal graduate study, seminars, special institutes, memberships in professional organizations and other structured educational opportunities.

Preliminary Coursework for Engineering Students

The Engineering Bachelor of Science programs are founded on a set of coursework that is designed to give each student a thorough foundation of knowledge on which specialization studies and a professional career can be based. Emphasis is placed on three key elements: development of communication skills, familiarity with the social sciences and humanities and a solid base in science and mathematics. Students selecting an Engineering major should be aware of specific requirements. Students may consult the College's Advising Office for detailed information.

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Professional Registration

Students who have attained senior status, and are in good academic standing in an ABET accredited engineering program, are eligible to register for examinations leading to licensure as a professional engineer. The first examination, called the Fundamentals of Engineering (FE) Exam, is offered by the Florida Board of Professional Engineers and is usually taken the semester prior to graduation. In addition to the knowledge acquired through the engineering curriculum, many students take advantage of review courses offered in the College of Engineering to prepare for the Fundamentals of Engineering Examination. Registering for the FE exam during the senior year is strongly encouraged.

Engineering Students in the University Honors College

Engineering students participating in the University Honors Program are able to complete their Engineering Bachelor's degree in four years. Students who qualify for the Honors Program at USF should contact the Honors College or Engineering Student Services to learn about the benefits of this prestigious program.

Army, Air Force and Naval R.O.T.C. for Students

The academic and technological knowledge an engineering degree provides a distinct advantage to individuals interested in a military appointment or career. This is especially true for those participating in one of the ROTC programs at USF.

Disruption of Academic Process and Academic Dishonesty

The College of Engineering will maintain an environment that encourages all to study and conduct engineering research free from undue disruption. Disruption of the Academic Process is a matter the College is obliged to report to Student Judicial Services. Academic dishonesty, in any form, is taken very seriously by the College of Engineering and will result in sanctions. The most serious penalty is dismissal from the University. (See University policies - Academic Integrity of Students.)

Student Academic Grievance Procedure

Students should make themselves fully aware of the University's grievance procedures. (See University policies regarding student academic grievance procedures.)

Preparation for Engineering

The high school student anticipating a career in engineering should present a strong academic record including four years of advanced high school mathematics and science including chemistry and physics. Prospective students who lack sufficient preparation in high school may need additional preparatory coursework at the University of South Florida.

Accelerated Bachelor's and Master's Program

Well-qualified students who, at the beginning of their senior year, are clearly interested in graduate study are invited to apply to the individual accelerated academic programs offered by various departments within the College of Engineering.

Minimum Performance and Graduation Requirements

Minimum Requirements

All undergraduate students with a student classification of engineering and students who have been admitted to any academic program in the College of Engineering must maintain a minimum cumulative GPA of 2.0 in each of the following categories:

1. Overall Undergraduate GPA
2. USF GPA
3. Math and Science courses (best attempt)
4. Engineering Courses
5. Prerequisite courses for the major
6. Courses within the major

Note: In no case will the minimum GPA for a category be less than 2.0.

Students who do not meet the required minimum GPA in each category are ineligible for further registration in the College unless individually designed academic plans to correct their GPA deficiencies are recommended by their academic advisor. Approved plans must include a strategy to eliminate the deficiency in two semesters or less by meeting specific goals. Students who are afforded this opportunity will be closely monitored. Those who, for any reason, fail to meet the terms of their academic plans will be ineligible to declare or continue to declare a major, or intended major, in the College of Engineering and will be ineligible to register for courses that are restricted to College of Engineering students. All undergraduate students admitted to the College of Engineering must earn the required grade in math, science, and engineering courses in no more than two (2) registered attempts. Grades of W, I, IF, U, R, and M are considered attempts. Those who, for any reason, fail to meet this requirement will be ineligible to declare or

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continue to declare a major, or intended major, in the College of Engineering and will be ineligible to register for courses that are restricted to college students. However, for the purpose of continuation in the in the Computer Science and Computer Engineering programs, attempts in CDA 3103 and COP 3514 are limited to two.

Students who are ineligible for further registration in the College of Engineering will be provided with a wide range of services to assist them in selecting a new career path. Students who have been academically dismissed from the University of South Florida, or leave on probation, may choose to attend another institution of higher learning and reapply to USF after improving their overall GPA. These returning students will be considered for readmission to the College if they meet the minimum College of Engineering admission requirements for transfer students and the program entrance requirements for their intended major as published in the University of South Florida Undergraduate Catalog in effect during the term of return.

Years to Degree

The College of Engineering requires that a student complete the baccalaureate degree within five years after beginning engineering specialization courses. Specialization courses taken more than five years prior to graduation will not be counted toward the degree. Exceptions may be granted by the academic department.

University, College and Program Requirements

The College requirements described in the section above are in addition to requirements set forth in the University policy and procedures section and the departmental sections of this catalog. It is the student's responsibility to complete all university, college, program and curricular requirements prior to graduation.

Student Laptop Computer Requirement

All students entering the College of Engineering are required to have a laptop computer that they can use in their engineering classes and labs. The laptop computer must be capable of connecting to the Internet via wireless. The minimum computer requirements can be found on the College of Engineering website. Students in the Information Technology program may not need a laptop, a desktop computer may be sufficient.

Graduation Application Procedures and Deadlines

Each College of Engineering student is required to complete an application for graduation and graduation checklist. Students should meet with their program advisor to review graduation qualifications and obtain approval well in advance of the College graduation application deadline. The graduation application deadline for the college is set prior to the university deadline and is posted on the College of Engineering Student Services website.

Note: Applications are generally due before the beginning of the graduating term. Individual academic departments may have a graduation application deadline that precedes the college one.

Grading Requirements

Grading Policies

1. S/U Grading Policy

Students pursuing College of Engineering degree programs are expected to take their courses on a graded basis. Please refer to the grading system in the Academic Policies and Procedures section of this catalog. S/U grading option must be requested during the first week of classes. Courses taken on an S/U basis are not applicable to the College's degree programs. Exceptions require written approval of the department advisor prior to registration.

2. I Grade Policy

The criteria for requesting and time limit for completing a grade of "I" (incomplete) are detailed in the Academic Policies and Procedures portion of this Catalog. A written agreement detailing the specific requirements and time limit for completion is required.

Full tuition must be paid and an audit form must be submitted to the Registrar's Office by the end of the first week of classes if a student wishes to attend the course again to review the material. If a student registers for the course but does not request to audit the course, a grade will be submitted for the subsequent registration and an I grade will remain on the transcript.

3. Minimum Acceptable Grade in Required Courses

The minimum acceptable grade in math and science prerequisites is a C (C- is insufficient). The minimum acceptable grade in courses is determined by the academic department. Students are strongly encouraged to familiarize themselves with the math/science GPA required for admission to the intended department as well as the minimum grade required in engineering courses. Grades higher than the minimum of C may be indicated.

Following are the undergraduate academic programs offered by the College of Engineering:

Bachelor of Science in Biomedical Engineering (B.S.B.E.)

Biomedical Engineering (EBC)

Bachelor of Science in Chemical Engineering (B.S.C.H.)

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Chemical Engineering (ECH)

Bachelor of Science in Civil Engineering (B.S.C.E.)

Civil Engineering (ECE)

Bachelor of Science in Computer Engineering (B.S.C.P.)

Computer Engineering (ECP)

Bachelor of Science in Computer Science (B.S.C.S.)

Computer Science (BCS)

Bachelor of Science in Electrical Engineering (B.S.E.E.)

Electrical Engineering (EEL)

Bachelor of Science in Industrial Engineering (B.S.I.E.)

Industrial Engineering (EIE)

Bachelor of Science in Information Technology (B.S.I.T.)

Information Technology (ITC)

Bachelor of Science in Mechanical Engineering (B.S.M.E.)

Mechanical Engineering (EME)

Accelerated Programs

B.S.C.H. in Chemical Engineering/M.S.B.E. in Biomedical Engineering

B.S.C.H. in Chemical Engineering/M.S.C.H. in Chemical Engineering

B.S.C.H. in Chemical Engineering/M.S.E.M. in Engineering Management

B.S.C.H. in Chemical Engineering/M.S.M.S.E. in Materials Science and Engineering

B.S.C.P. in Computer Engineering/M.S.C.P. in Computer Engineering

B.S.C.P. in Computer Engineering/M.S.C.S. in Computer Science

B.S.C.P. in Computer Engineering/M.S.I.T. in Information Technology

B.S.I.E. in Industrial Engineering/M.S.B.E. in Biomedical Engineering

B.S.I.E. in Industrial Engineering/M.S.E.M. in Engineering Management

B.S.M.E. in Mechanical Engineering/M.S.B.E. in Biomedical Engineering

B.S.M.E. in Mechanical Engineering/M.M.E. in Mechanical Engineering

B.S.M.E. in Mechanical Engineering/M.S.M.E. in Mechanical Engineering

B.S.M.E. in Mechanical Engineering/M.S.E.M. in Engineering Management

B.S.M.E. in Mechanical Engineering/M.S.M.S.E. in Materials Science and Engineering

Minors

Biomedical Engineering (EBI)

Computer Science (BCS)

Information Technology (ITC) (formerly IT General Minor)

Certificates

Foundations of Cyber Security

The following minor is accepting no new admission because it was discontinued effective Fall 2017:

IT Technical Minor

Undergraduate Advising Information

Student Advising

Effective pursuit of engineering and engineering related studies requires careful attention to both the sequence and the type of courses taken. The engineering curriculum differs in key respects from the study plans of other majors even in the first year. Professional advisors in the College of Engineering provide individualized academic planning and guidance. New students must attend the University's Orientation program. They will be introduced to the Engineering advisors during this program and receive advisement for their first semester. The student and advisors jointly work out a plan of study that meets both the student's career objectives and the College of Engineering's degree requirements. While the College provides advising services to assist students with academic planning, the student is responsible for knowing and meeting all performance standards and graduation requirements.

All Engineering majors are advised by the Office of Engineering Student Services. Please visit <http://www.usf.edu/engineering/student-services/academic-advising/> for a list of advisors and their contact information.

Advising Center

Tampa Campus: Engineering Building III, (ENC), TECO Energy Hall, Room 1302, (813) 974-2684. Visit <http://www.usf.edu/engineering/student-services/>.

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COLLEGE OF ENGINEERING ADVISING INFORMATION

Major	Advisor	Email	URL
All Engineering Majors	Lili Clark	lmclark@usf.edu	http://www.usf.edu/engineering/student-services/academic-advising/
All Engineering Majors	Eva Fernandez	ecfernand@usf.edu	http://www.usf.edu/engineering/student-services/academic-advising/
All Engineering Majors	Pat Homer	homer@usf.edu	http://www.usf.edu/engineering/student-services/academic-advising/
All Engineering Majors	Pachara Mayton	pmayton@usf.edu	http://www.usf.edu/engineering/student-services/academic-advising/
All Engineering Majors	Clara Ohannes	cohannes@usf.edu	http://www.usf.edu/engineering/student-services/academic-advising/
All Engineering Majors	Suzy Schmieder	sschmieder@usf.edu	http://www.usf.edu/engineering/student-services/academic-advising/

In order to schedule a meeting with an advisor in this college, please use [escheduler](#).

• B.S.B.E. - BIOMEDICAL ENGINEERING (EBC) (CIP = 14.0701) TOTAL DEGREE HOURS: 131

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

Mission Statement

The academic mission of the Department of Medical Engineering is to prepare graduates with fundamental knowledge and contemporary skills for the development, economic design, and safe operation of biomedical and biological systems, processes, products, drugs and methods in a manner compatible with societal healthcare values.

Entrance Requirements for the Biomedical Engineering Program

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Biomedical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, the department may have continuation requirements which specify minimum performance standards in core engineering courses which must be met before further registration in the department is granted.

Minimum Admission Requirements for the Biomedical Engineering Department

- Completion of:
 - Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - General Chemistry I with Lab (CHM 2045 and CHM 2045L)
2. A minimum grade of C in each course and a 2.75 GPA (based on best attempt) in these courses.
3. A minimum overall GPA of 2.5.
4. A minimum USF GPA of 2.5.

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

- Mandatory academic advising of students for each term.
- Exit interviews as a graduation requirement.

GPA and Grade Requirement

Many courses required for the BSBE degree in Biomedical Engineering have other prerequisite courses. Prerequisite courses must be completed with a C or better before the student is allowed to take the course. This applies to prerequisite courses taken in other departments as well.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

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If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to their intended department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

The following are transferable courses from the Florida College System Institution that will be accepted in the Math/Science/Engineering areas:

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

Courses at a Florida College System Institution

MAC X311 or MAC X281
MAC X312 or MAC X282
MAC X313 or MAC X283
MAP X302 or MAP X305

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHM 2046/CHM 2046L General Chemistry II with Lab
PHY 2048/2048L General Physics I - Calculus Based with Lab
PHY 2049/2049L General Physics II - Calculus Based with Lab

Courses at a Florida College System Institution

CHM X045/X045L or CHM X045C or CHS X440/X440L
CHM X046/X046L or CHM X046C
PHY X048/X048L or PHY X048C or PHY X043/X048L
PHY X049/X049L or PHY X049C or PHY X044/X04

REQUIREMENTS FOR THE MAJOR IN BIOMEDICAL ENGINEERING

TOTAL MAJOR HOURS: 103

Major requirements for the B.S.B.E. Degree:

Major Core (91 hours)

Math and Science (44 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
EGN 3433 Modeling and Analysis of Engineering Systems or MAP 2302 Differential Equations
(EGN 3433 may be taken by FTIC students and transfer students are accepted with MAP 2302)

BSC 2010 Cellular Processes
BSC 2010L Cellular Processes Laboratory
BSC 2011 Biodiversity
BSC 2011L Biodiversity Laboratory
CHM 2045 General Chemistry I
CHM 2045L General Chemistry I Laboratory
CHM 2046 General Chemistry II
CHM 2046L General Chemistry II Laboratory
CHM 2210 Organic Chemistry I
CHM 2210L Organic Chemistry I Laboratory
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
PHY 2049 General Physics II
PHY 2049L General Physics II Laboratory

Basic Engineering (13 credit hours)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering Lab
EGN 3311 Statics
EGN 3343 Thermodynamics I

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EGN 3373 Introduction to Electrical Systems I

EGN 3443 Probability and Statistics for Engineers

Specialization (31 credit hours)

BME 3032 Biomedical Transport Process

BME 3053 Computer Programming for Biomedical Engineers

BME 3312 Molecular and Cellular Engineering

BME 4056C Biomedical Engineering Lab I

BME 4057C Biomedical Engineering Lab II

BME 4100 Biomedical Engineering

BME 4409 Engineering Physiology (PR: ECH 4846, EGN 3433)

BME 4503 Biomedical Instrumentation

BME 4508 Biomedical Signals and Systems Analysis

BME 4882 Biomedical Engineering Design I

BME 4883 Biomedical Engineering Design II

Technical Writing (3 credit hours)

ENC 3246 Communications for Engineers (WRIN)

Major Electives (12 hours)

6 hours of BME Upper-Level Electives

6 hours of STEM Upper-Level Electives (Students pursuing Medical School will take CHM 2211 Organic Chemistry II/L for five credit hours and a one-credit hour elective)

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

1. Mandatory academic advising of students for each term.
2. Exit interviews as a graduation requirement.

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic Engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

Foundations of Knowledge and Learning (FKL) Requirement

The Math and Science courses required for this major fully meet the Math and Science requirements of the Foundations of Knowledge and Learning Core Curriculum.

Research Opportunities

All undergraduate students in any degree program can participate in undergraduate research. There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912, IDS 4914 or IDH 4910 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience. The Office for Undergraduate Research will assist students in understanding the various course options.

Advising Information

All incoming freshman and transfer students must meet with one of the college advisors in the Engineering Student Services (ESS).

Engineering Student Services

Office: Engineering Building III (ENC) 1302

Phone: (813) 974-2684

Email: eng-bme@usf.edu

Website

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BIOMEDICAL ENGINEERING FACULTY

Interim Chair and Director: R Frisina, Jr.; *Professors:* Robert Frisina, Jr., Huabei Jiang; *Research Professor:* Hao Yang; *Instructor:* Michael Miller.

• B.S.C.H. - CHEMICAL ENGINEERING (ECH) (CIP = 14.0701)

TOTAL DEGREE HOURS: 131

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

Students pursuing the Bachelor of Science in Chemical Engineering take coursework in advanced chemistry, thermodynamics, fluids, heat, and mass transfer, numerical methods, separation processes, reacting systems, instrumentation, control, and plant design. Students must also satisfactorily complete a design project as part of their program. Chemical and Biomedical engineering students must maintain a GPA of 2.0 in required departmental courses. Therefore, it is imperative that the students retain close contact with their advisor.

Students completing this program normally initiate their careers in manufacturing, environmental, and biological enterprises. Chemical engineers are found in administrative, technical, and research positions in these industries. Main products of these industries are petrochemicals, polymers, fibers, natural and synthetic fuels, electronic materials, fertilizers, pharmaceuticals, bio-materials, etc.

Mission Statement

The mission of the Department of Chemical & Biomedical Engineering is to prepare graduates with fundamental knowledge and contemporary skills for the development, economic design, and safe operation of chemical and biological systems, processes, products, and methods in a manner compatible with societal values.

Program Educational Objectives

The overall objective of the bachelor's degree program in chemical engineering at the University of South Florida is to prepare graduates for successful careers in the chemical engineering and related professions. Accordingly, graduates of this program who have chosen to pursue a career in engineering shall achieve the following within a few years after graduation:

1. Demonstrate professional engineering competence by holding positions of increasing responsibility in industry, business, government and/or educational institutions
2. Publish papers, reports, patents and/or technical presentations at local, national, international meetings or within the professional organization/company that they are affiliated with.
3. Continue to improve their technical skills, knowledge and understanding through continuing education, pursuit of advanced degrees, and/or pursuit of professional license in their chosen profession.

Please refer to the mission statement on the department website for additional information.

Entrance Requirements for the Chemical Engineering Program

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Chemical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, the department may have continuation requirements which specify minimum performance standards in core engineering courses which must be met before further registration in the department is granted.

Minimum Admission Requirements for the Chemical Engineering Department

1. Completion of:
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - o General Chemistry I with Lab (CHM 2045 and CHM 2045L)
2. A minimum grade of C in each course and a 2.75 GPA (based on best attempt) in these courses.
3. A minimum overall GPA of 2.0.
4. A minimum USF GPA of 2.0.

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

1. Mandatory academic advising of students for each term.
2. Exit interviews as a graduation requirement.

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GPA and Grade Requirement

Many courses required for the BS degree in Chemical Engineering have other prerequisite courses. Prerequisite courses must be completed with a C- or better before the student is allowed to take the course. This applies to prerequisite courses taken in other departments as well. The only exceptions are the Admissions Requirements courses, which must be passed with a grade of C or better. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to their intended department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

The following are transferable courses from the Florida College System Institution that will be accepted in the Math/Science/Engineering areas:

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

Courses at a Florida College System Institution

MAC X311 or MAC X281
MAC X312 or MAC X282
MAC X313 or MAC X283
MAP X302 or MAP X305

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHM 2046/CHM 2046L General Chemistry II with Lab
PHY 2048/2048L General Physics I - Calculus Based with Lab
PHY 2049/2049L General Physics II - Calculus Based with Lab

Courses at a Florida College System Institution

CHM X045/X045L or CHM X045C or CHS X440/X440L
CHM X046/X046L or CHM X046C
PHY X048/X048L or PHY X048C or PHY X043/X048L
PHY X049/X049L or PHY X049C or PHY X044/X04

REQUIREMENTS FOR THE MAJOR IN CHEMICAL ENGINEERING

TOTAL MAJOR HOURS: 107

Major requirements for the B.S.C.H. Degree:

Major Core (94 hours)

Math and Science (36 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
EGN 3433 Modeling and Analysis of Engineering Systems or MAP 2302 Differential Equations
CHM 2045 General Chemistry I
CHM 2045L General Chemistry I Laboratory
CHM 2046 General Chemistry II
CHM 2046L General Chemistry II Laboratory
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
PHY 2049 General Physics II
PHY 2049L General Physics II Laboratory

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- CHM 2210 Organic Chemistry I
- CHM 2210L Organic Chemistry Laboratory I
- Basic Engineering (4 credit hours)
 - EGN 3000 Foundations of Engineering
 - EGN 3000L Foundations of Engineering Lab
 - EGN 3343 Thermodynamics I
- Specialization (51 credit hours)
 - ECH 3002 Introduction to Chemical & Biomedical Engineering
 - ECH 3854 Chemical & Biomedical Engineering Computations
 - ECH 3023 Material and Energy Balances
 - ECH 4123 Chemical Engineering Thermodynamics
 - ECH 3266 Transport Phenomena I
 - ECH 4846 Numerical Methods in Chemical Engineering
 - ECH 3702 Instrument Systems I
 - ECH 4418 Separation Processes
 - ECH 4267 Transport Phenomena II
 - BME 4406 Engineering of Biological Systems
 - ECH 3240L Chemical Engineering Lab I
 - ECH 4504 Kinetics and Reaction Engineering
 - ECH 4605 Product and Process Systems Engineering
 - EMA 4003 Introduction to Materials Science
 - ECH 4241L Chemical Engineering Laboratory II
 - ECH 4323 Process Dynamics and Control
 - ECH 4615 Product and Process Design (CPST)
- Technical Writing (3 credit hours)**
 - ENC 3246 Communications for Engineers (WRIN)

Major Electives (13 hours)

- 13 hours of Departmental Upper-Level Electives
 - BME 4100 Biomedical Engineering
 - BME 4409 Engineering Physiology
 - BME 4571 Nanomedicine
 - BME 4931 Selected Topics in Biomedical Engineering
 - ECH 4905 Independent Study
 - ECH 4931 Special Topics in Chemical Engineering II
 - ECH 4936 Undergraduate Seminar
 - ECH 4944 Industry Internship

Consult with the department undergraduate advisor for additional departmental electives and special topics courses that may be available.

Entrance Requirements for the Chemical Engineering Program

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Chemical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, the department may have continuation requirements which specify minimum performance standards in core engineering courses which must be met before further registration in the department is granted.

Minimum Admission Requirements for the Chemical Engineering Department

1. Completion of:
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - o General Chemistry I with Lab (CHM 2045 and CHM 2045L)
2. A minimum grade of C in each course and a 2.75 GPA (based on best attempt) in these courses.
3. A minimum overall GPA of 2.0.
4. A minimum USF GPA of 2.0.

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

1. Mandatory academic advising of students for each term.
2. Exit interviews as a graduation requirement.

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GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Grading Requirement

Many courses required for the BS degree in Chemical Engineering have other prerequisite courses. Prerequisite courses must be completed with a C- or better before the student is allowed to take the course. This applies to prerequisite courses taken in other departments as well. The only exceptions are the Admissions Requirements courses, which must be passed with a grade of C or better (C- is insufficient).

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and by selecting one technical or Foundation of Knowledge and Learning General Education course that is a State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) course or by completing an AA degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course. The credits earned for chemistry required by this major may count toward the FKL science requirement.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- ECH 4615 Product and Process Design (CPST)

Research Opportunities

The Research Experiences for Undergraduate Students program in the College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Graduate students and professors serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912, IDS 4914 or IDH 4910 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the College of Engineering and pursue actual internships during their sophomore, junior and senior years.

Chemical Engineering Accelerated Programs

Students majoring in Chemical Engineering have the option to pursue one of the following accelerated programs:

- B.S.C.H. in Chemical Engineering and M.S.B.E. in Biomedical Engineering

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- B.S.C.H. in Chemical Engineering and M.S.C.H. in Chemical Engineering
- B.S.C.H. in Chemical Engineering and M.S.E.M. in Engineering Management
- B.S.C.H. in Chemical Engineering and M.S.M.S.E. in Materials Science and Engineering

Accreditation Information

The Bachelor of Science degree program in Chemical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Advising Information

For questions about college and departmental admission, transferring from another institution or registration for prerequisite courses: <http://www.usf.edu/engineering/student-services/academic-advising/index.aspx>.

For questions specific to Chemical Engineering courses and curriculum: <http://www.usf.edu/engineering/chbme/undergraduate/index.aspx>.

CHEMICAL ENGINEERING FACULTY

Chair: C. Henderson; *Emeritus Professors:* J.C. Busot, C.A. Smith; *Distinguished University Professor:* D.Y. Goswami; *Professors:* N. Alcantar, V.R. Bhethanabotla, S.W. Campbell, R.D. Frisina Jr., R. Gilbert, V. Gupta, C. Henderson, B. Joseph, W.E. Lee, III, A.K. Sunol; *Associate Professors:* M. Jaroszeski, P. Koria, J. Kuhn, C. Passaglia, R. Toomey; *Assistant Professors:* A. Pyayt; *Instructors:* S.Pettit; *Interdisciplinary Professors:* D.A. Eddins, D.R. Frisina Sr., N. Gallant, A. Sagues, J.P. Walton; *Courtesy Faculty:* D. Allen-Gipson, R. Connolly, S.Decker, D. Haynie, J. Lloyd, D. McMillan, G. Philippidis, P. Sanberg, P. Simon, D. Stebbins.

• B.S.C.E. - CIVIL ENGINEERING (ECE) (CIP = 14.0801)

TOTAL DEGREE HOURS: 131

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

Civil engineers will be entrusted by society to create a sustainable world and enhance the global quality of life. Civil engineers will serve as master planners, designers, constructors, and operators of society's economic and social engine, the built environment (i.e., infrastructure); innovators and integrators of ideas and technology across the public, private, and academic sectors; managers of risk and uncertainty caused by natural events, accidents, and other threats; stewards of the natural environment and its resources; and, leaders in discussions and decisions shaping public environmental and infrastructure policy.

Mission Statement

The Civil Engineering Program of the Department of Civil and Environmental Engineering at the University of South Florida will provide undergraduate students with strong, broad-based, engineering education which gives them the basic intellectual and organization skills that allow them to work with complex systems with technological, social and environmental components.

As many of the Program's graduates begin work upon graduation in industry or with governmental organizations, the curriculum is designed to prepare students for these roles by requiring a number of courses in the various fields of civil engineering and by providing limited specialization in one given area. The curriculum is designed to encourage lifelong learning and to prepare students for undertaking advanced studies in engineering or in other professional areas.

Program Educational Objectives

The Civil Engineering Program and curriculum of the Department of Civil and Environmental Engineering are designed to meet the needs of all students within the context of the Program's Mission Statement. The Program Educational Objectives associated with the Program's Mission Statement are:

1. Graduates, within 3-6 years after graduation, can obtain positions in both public and private organizations.
2. Graduates, within 3 to 6 years after graduation, are continuing their professional development by extending their professional knowledge through independent learning, continuing education courses, conferences, workshops, short courses, graduate study and involvement in professional societies.
3. Graduates, within 3 to 6 years after graduation, who are working in public or private organizations which encourage professional registration, will have made appropriate progress towards achieving that registration.

Please refer to the mission statement on the department website for additional information.

Entrance and Continuation Requirements for the Civil Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Civil Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, the Department may have continuation

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requirements which specify minimum performance standards in core engineering courses which must be met before further registration in the Department is granted.

Minimum Admission Requirements for the Civil Engineering Department

1. Completion of:
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - o General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and CHS 2440L)with a minimum grade of a C in each course and a 3.0 GPA (based on best attempt) in these prerequisites
2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

Minimum Continuation Requirements for the Civil Engineering Department

Continuation requires a minimum grade of C- as well as a 2.5 GPA (based on best attempt) for the following courses:

- EGN 3311 Statics
- EGN 3331 Mechanics of Materials
- EGN 3353 Basic Fluid Mechanics
- EGN 3365 Materials

GPA and Grade Requirements

Unless otherwise stated, the minimum acceptable grade in all BSCE required math, science, engineering, and specialization courses is a C- or higher. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Tracks

In addition to designated common coursework in engineering mechanics, civil, and environmental engineering, students undertake a concentration of 15 hours of coursework plus a 3-hour capstone design course and a 1 hour Professional and Ethical Issues in Engineering.

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

- All students must participate in mandatory advising prior to each term.
- All students must participate in department assessment activities and successfully complete an exit interview before graduating.
- All students must consider the advice of the Department to complete and pass the Fundamentals of Engineering Exam (F.E. Exam).
- All students must periodically provide writing samples as part of the department's writing assessment program.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to their intended department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all of the other admissions requirements of the University and College.

The following are transferable courses from a Florida College System institution that will be accepted in the Math/Science/Engineering areas:

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I

Courses at a Florida College System Institution

MAC X311 or MAC X281

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MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

MAC X312 or MAC X282
MAC X313 or MAC X283
MAP X302 or MAP X305

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab

Courses at a Florida College System Institution

CHM X045/X045L or CHM X045C or

CHS 2440/CHS 2440L General Chemistry for Engineers
with Lab

CHS X440/X440L

PHY 2048/PHY 2048L General Physics I - Calculus
Based with Lab

PHY X048/X048L or PHY X048C or PHY X043/X048L

PHY 2049/PHY 2049L General Physics II - Calculus
Based with Lab

PHY X049/X049L or PHY X049C or PHY X044/X049L

REQUIREMENTS FOR THE MAJOR IN CIVIL ENGINEERING

TOTAL MAJOR HOURS: 110

Major requirements for the B.S.C.E. Degree:

Major Core (110 hours)

Math and Science (27 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
MAP 2302 Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems
CHS 2440 General Chemistry for Engineers or CHM 2045 General Chemistry I
CHS 2440L General Chemistry for Engineers Laboratory or CHM 2045L General Chemistry I Laboratory
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
PHY 2049 General Physics II
PHY 2049L General Physics II Laboratory

Basic Engineering (26 credit hours)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering lab
GLY 3850 Geology for Engineers
EGN 1113 Introduction to Design Graphics
EGN 3321 Dynamics
EGN 4453 Numerical and Computer Tools I in Civil & Environmental Engineering
EGN 3331L Mechanics of Materials Laboratory
EGN 3343 Thermodynamics
EGN 3443 Probability and Statistics for Engineers
EGN 3615 Engineering Economics with Social and Global Implications
EGN 3373 Introduction to Electrical Systems I

Continuation Courses (12 credit hours)

EGN 3311 Statics
EGN 3365 Materials Engineering
EGN 3331 Mechanics of Materials
EGN 3353 Basic Fluid Mechanics

Specialization (21 credit hours)

EGN 4454 Numerical and Computer Tools II in Civil & Environmental Engineering
ENV 4001 Environmental Systems Engineering
TTE 4004 Transportation Engineering I
CES 3102 Structures I
CWR 4202 Hydraulics
ENV 4004L Environmental/Hydraulics Engineering Lab
CEG 4011 Geotechnical Engineering I
CEG 4011L Geotechnical/Transportation Laboratory
CGN 4122 Professional and Ethical Issues in Engineering

Technical Writing (3 credit hours)

ENC 3246 Communications for Engineers (WRIN)

Capstone Design (3 credit hours)

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Structures/Materials/Geotechnical Track: CES 4750 Capstone Structural/Geotechnical/Material Design

Geotechnical/Transportation Track: CEG 4850 Capstone Geotechnical/Transportation Design

Environmental/Water Resources Track: CWR 4812 Capstone Water Resources/Environmental Design

Civil Engineering Track and Capstone Design Requirements (part of the Specialization course)

Civil Engineering students choose one of the three tracks listed below:

Structures/Materials/Geotechnical Track

CES 4702 Concepts of Concrete Design

CES 4605 Concepts of Steel Design

CGN 4851 Concrete Construction Materials

CEG 4012 Geotechnical Engineering II **or** TTE 4005 Transportation Engineering II

Technical Elective (three credit hours total, from the approved list of courses)

CES 4750 Capstone Structural/Geotechnical/Material Design

Geotechnical/Transportation Track

CGN 4851 Concrete Construction Materials

CEG 4012 Geotechnical Engineering II

TTE 4005 Transportation Engineering II

Technical Elective (six credit hours total, from the approved list of courses)

CEG 4850 Capstone Geotechnical/Transportation Design

Environmental/Water Resources Track

ENV 4417 Water Quality and Treatment

CWR 4540 Water Resources Engineering I

CEG 4012 Geotechnical Engineering II **or** TTE 4005 Transportation Engineering II

Technical Elective (six credit hours total, from the approved list of courses)

CWR 4812 Capstone Water Resources/Environmental Design

Entrance Requirements for the Civil Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Civil Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, the Department may have continuation requirements which specify minimum performance standards in core engineering courses which must be met before further registration in the Department is granted.

Minimum Admission Requirements for the Civil Engineering Department

1. Completion of:
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - o General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and CHS 2440L)

with a minimum grade of a C in each course and a 3.0 GPA (based on best attempt) in these prerequisites

2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

Minimum Continuation Requirements for the Civil Engineering Department

Continuation requires a minimum grade of C- as well as a 2.5 GPA (based on best attempt) for the following courses:

- EGN 3311 Statics
- EGN 3331 Mechanics of Materials
- EGN 3353 Basic Fluid Mechanics
- EGN 3365 Materials

Tracks

In addition to designated common coursework in engineering mechanics, civil, and environmental engineering, students undertake a concentration of 15 hours of coursework plus a 3-hour capstone design course and a 1 hour Professional and Ethical Issues in Engineering.

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

- All students must participate in mandatory advising prior to each term.
- All students must participate in department assessment activities and successfully complete an exit interview before graduating.
- All students must consider the advice of the College to complete and pass the Fundamentals of Engineering Exam (F.E. Exam).

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- All students must periodically provide writing samples as part of the department's writing assessment program.

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Grading Requirement

Unless otherwise stated, the minimum acceptable grade in all BSCE required math, science, engineering, and specialization courses is a C- or higher.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses required for the major, ENC 1101, ENC 1102, ENC 3246 and by selecting one technical or Foundation of Knowledge and Learning General Education course that is an approved State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) course or by completing an AA degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course. The credits earned for chemistry required by this major may count toward the FKL science requirement.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- CES 4750 Capstone Structural/Geotechnical/Material Design (CPST) or CEG 4850 Capstone Geotechnical/Transportation Design (CPST) or CWR 4812 Capstone Water Resources/Environmental Design (CPST).

Research Opportunities

The Research Experiences for Undergraduate Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Graduate students and professors serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912, IDS 4914 or IDH 4910 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the College of Engineering and pursue actual internships during their sophomore, junior and senior years.

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Accreditation Information

The Bachelor of Science degree program in Civil Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Advising Information

All incoming freshman and transfer students must meet with one of the college advisors in the Engineering Student Services (ESS).

Engineering Student Services

Office: Engineering Building III (ENC) 1302

Phone: (813) 974-2684

Email: eng-advisingmail@usf.edu

Website

Students who have completed the entrance requirements and are accepted into the major: <http://www.usf.edu/engineering/cee/about-us/contact-us.aspx>.

CIVIL ENGINEERING FACULTY

Chairperson: M. Gunaratne; *Professors Emeriti:* M. W. Anderson, W. Carpenter, R.P. Carnahan, S. Kranc; *Distinguished University Professor:* A.A. Sagüés; *State of Florida 21st Century World Class Scholar:* J. Mihelcic; *Professors:* R. Bertini, S. Ergas, M. Gunaratne, F. Mannering, J. Mihelcic, A.G. Mullins, M. Nachabe, M.A. Ross, A.A. Sagüés, R. Sen, A. Zayed; *Associate Professors:* J. Cunningham, Q. Lu, A. Pinjari, D. Simkins, A. Tejada, M. Trotz, D. Yeh, Q. Zhang, Y. Zhang; *Assistant Professors:* M. Arias, X. Li; *Instructor:* K. Nohra; M. Stokes; *Courtesy Faculty:* N. Albergo, B. Behzadi, J. Lu, S.E. Polzin, N. Poor, A. Stuart.

• B.S.C.P. - COMPUTER ENGINEERING (ECP) (CIP = 14.0901 - TRACK 1 OF 3) TOTAL DEGREE HOURS: 128

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

The Computer Engineering program emphasizes the application of engineering principles to the design of computer hardware and software, and devotes additional time to computer architecture and advanced topics in hardware design, including extensive laboratory work. Students in this program also acquire a background in engineering topics through related coursework in the College.

Mission Statement

In keeping with the mission of the College of Engineering, the Department of Computer Science and Engineering strives for excellence in teaching, research, and public service. Specifically, the Department aspires to:

1. Lead the advancement of computer science, computer engineering, and information technology through internationally recognized research and graduate education, as well as technology transfer to regional industries.
2. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning.
3. Educate students in the best practices of the field as well as integrate the latest research into the curriculum.
4. Foster the development of problem solving and communication skills as an integral component of the profession.
5. Provide quality learning experiences through small classes, active learning styles of teaching, and opportunities for meaningful interactions between students and faculty.

Objectives

The Department of Computer Science and Engineering has established the following program educational objectives for computer engineering graduates of the Department.

1. Our computer engineering graduates will apply their knowledge and skills to succeed in their career and/or obtain an advanced degree.
2. Our graduates will function ethically and responsibly, and will remain informed and involved as full participants in our profession and our society.
3. Our graduates will successfully function in multi-disciplinary teams.
4. Our graduates will apply basic principles and practices of computing grounded in mathematics and science to successfully complete hardware and/or software related engineering projects to meet customer business objectives and/or productively engage in research.

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Entrance and Continuation Requirements for the Computer Engineering Program

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Computer Engineering. Prior to being admitted to a program, a student may take no more than two Departmental courses.

Minimum Admission Requirements for the Computer Engineering Program

1. Completion of:
 - o English Composition I (ENC 1101) and English Composition II (ENC 1102)
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)

All students must complete the equivalent of USF Composition I & II, Engineering Calculus I & II and Calculus-based General Physics I & II (with Labs) with minimum grades of C in each course (grades of C- are insufficient). The minimum overall average GPA in these six courses required for admission to the Department is between 3.0 and 3.5 for any given year. The minimum acceptable average GPA will be posted on the Department's website one year prior to the Fall Semester that the revised GPA is applicable. The computed GPA is based on the best attempts in these courses.

2. Completion of COP 2510 with a minimum grade of B (grade of B- is insufficient) or another introductory programming course covering a modern programming language, with an emphasis on programming concepts and design methodology with a minimum grade of B (grade of B- is insufficient).
3. A minimum overall GPA of 2.0
4. A minimum USF GPA of 2.0

Minimum Continuation Requirements for the Computer Engineering Program

Students meeting the above requirements may be admitted to either of the Computer Engineering or Computer Science degree tracks; however, continuation in the program will be allowed only for students who complete CDA 3103 and COP 3514 with minimum grades of B, based on best attempts in each course (grades of B- are insufficient). These requirements must be met with a maximum of two attempts allowed for each course.

GPA and Grade Requirements

Unless otherwise stated, the minimum acceptable grade in all BSCP required math, science, and engineering courses is a C or higher (C- is insufficient). The minimum acceptable grade in specialization courses is a C-, except as stated in the program admission and continuation requirements. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Departmental Policies

In addition to the College's graduation requirements, the Department has the following policies:

1. Mandatory academic advising and/or mentoring of students.
2. Exit interview and/or survey as a graduation requirement

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to the Department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

Courses at a Florida College System Institution

MAC X311 or MAC X281
MAC X312 or MAC X282
MAC X313 or MAC X283
MAP X302

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Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHS 2440/CHS 2440L General Chemistry for Engineers
with Lab

PHY 2048/PHY 2048L General Physics I - Calculus
Based with Lab

PHY 2049/PHY 2049L General Physics II - Calculus
Based with Lab

COP XXXX Introduction Programming in C, C++, JAVA
or equivalent language

Courses at a Florida College System Institution

CHM X045/X045L or CHM X045C or
CHS X440/X440L

PHY X048/X048L or PHY X048C

PHY X049/X049L or PHY X049C

COP XXXX Introduction Programming in C, C++, JAVA
or equivalent language

REQUIREMENTS FOR THE MAJOR IN COMPUTER ENGINEERING TOTAL MAJOR HOURS: 107

Major requirements for the B.S.C.P. Degree:

Major Core (95 hours)

Math and Science (27 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
MAP 2302 Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems
CHM 2045 General Chemistry I or CHS 2440 Chemistry for Engineers
CHM 2045L General Chemistry I Laboratory or CHS 2440L Chemistry for Engineers Lab
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
PHY 2049 General Physics II
PHY 2049L General Physics II Laboratory

Basic Engineering (15 credit hours)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering Lab
EGN 3373 Introduction to Electrical Systems I
EGN 3443 Probability and Statistics for Engineers
EGN 3615 Engineering Economics with Social and Global Implications
EGN 4450 Introduction to Linear Systems
EEE 3394 Electronic Materials

Specialization (44 credit hours)

COP 2510 Programming Concepts
COP 3514 Program Design
COP 3331 Object-Oriented Software Design
COP 4530 Data Structures
COP 4600 Operating Systems
CDA 3103 Computer Organization
CDA 3201 Computer Logic and Design
CDA 3201L Computer Logic and Design Lab
CDA 4203 Computer System Design
CDA 4203L Computer System Design Lab
CDA 4205 Computer Architecture
CDA 4213 CMOS-VLSI Design
CDA 4213L CMOS-VLSI Design Lab
COT 3100 Introduction to Discrete Structures
COT 4400 Analysis of Algorithms
CIS 4250 Ethical Issues and Professional Conduct (CPST)
CIS 4910 Computer Science Project

Composition and Technical Writing (9 credit hours)

ENC 1101 Composition I
ENC 1102 Composition II
ENC 3246 Communication for Engineers (WRIN)

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Major Electives (12 hours)

Departmental upper-level technical electives are classified as “software”, “hardware”, and “theory”. Computer Engineering students must choose 6 hours of hardware electives and an additional, non-overlapping 6 hours of electives in the Department. A maximum of six (6) hours combined of CIS 4900 and/or any other supervised individual study (that is, CIS 4915 and CIS 4940) are allowed as Departmental upper-level technical electives.

Software Electives:

- CAP 4034 Computer Animation Fundamentals
- CAP 4063 Web Application Design
- CAP 4401 Image Processing Fundamentals
- CAP 4410 Computer Vision
- CAP 4662 Introduction to Robotics
- CAP 4800 Systems Simulation
- CEN 4020 Software Engineering
- CEN 4072 Software Testing
- CEN 4721 User Interface Design
- CIS 4364 Cryptology and Information Security
- CNT 4004 Computer Networks I
- CNT 4411 Computing and Network Security
- CNT 4504 Computer Networks II
- COP 3257 JAVA Experienced Programmers
- COP 4020 Programming Languages
- COP 4365 Software Systems Development
- COP 4620 Compilers
- COP 4656 Software Development for Mobile Devices
- COP 4710 Database Design

Hardware Electives:

- CDA 4253 FPGA Design and Analysis
- CDA 4621 Control of Mobile Robots

Theory Electives:

- COT 4115 Advanced Discrete Structures with Cryptology
- COT 4210 Automata Theory and Formal Languages
- COT 4521 Computational Geometry

Other Courses

- CIS 4900 Independent Study
- CIS 4915 Supervised Research
- CIS 4940 Industry Internship

The Department website undergraduate section contains the most up to date list of Departmental upper-level technical electives. The prerequisite for most (but not all) Departmental upper-level technical electives is CDA 3201 Computer Logic and Design and COP 4530 Data Structures. Consult with the Department Undergraduate Advisor to learn more about available electives and which courses will and will not count towards the degree. Additional electives may be available with a special topics course number (typically, CIS 4930).

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Course Grade Requirement

Continuation in the major requires successful completion of CDA 3103 and COP 3514 with minimum grades of B, based on best attempts in each course. Grades of B- are insufficient. These requirements must be met with a maximum of two attempts allowed for each course.

Grading Requirement

Unless otherwise stated, the minimum acceptable grade in all BSCP required math, science, and engineering courses is a C or higher (C- is insufficient). The minimum acceptable grade in specialization courses is a C-, except as stated in the program admission and continuation requirements.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

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A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246, and CIS 4250 or by completing an A.A. degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math courses required for this major fully meet the math requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- CIS 4250 Ethical Issues and Professional Conduct (CPST)

Research Opportunities

The Research Experiences for Undergraduate Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Professors and graduate students serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912 or IDS 4914 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the College of Engineering and pursue actual internships during their sophomore, junior and senior years. **See the Department undergraduate advisor for more information on earning academic credit for internships.**

Computer Engineering Accelerated Programs

Students majoring in Computer Engineering have the option to pursue one of the following accelerated programs:

- B.S.C.P. in Computer Engineering and M.S.C.P. in Computer Engineering
- B.S.C.P. in Computer Engineering and M.S.C.S. in Computer Science
- B.S.C.P. in Computer Engineering and M.S.I.T. in Information Technology

Accreditation Information

The Bachelor of Science degree program in Computer Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Advising Information

Department Undergraduate Advisor: <http://www.usf.edu/engineering/cse/undergraduate/contacts.aspx>

COMPUTER ENGINEERING FACULTY

Chair: S. Sarkar; *Distinguished Professors:* L. Hall; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegler, S. Sarkar, A. Weitzenfeld; *Associate Professors:* S. Chellappan, A. Gaspar, A. Iamnitshi, S. Katkoori, J. Ligatti, X. Ou, Y. Sun, Y. Tu, H. Zheng; *Assistant Professors:* Y. Liu, P. Rosen; *Instructor II:* S. Fang, P. Ventura, J. Wang; *Instructor I:* W. Hendrix, I. Hidalgo, H. Jeanty, V. Korzhova, S. Small, R. Tindell, Y. Zhang; *Distinguished Professor Emeritus:* A. Kandel, N. Ranganathan; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

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• B.S.C.S. - COMPUTER SCIENCE (BCS) (CIP = 11.0101 - TRACK 1 OF 6) TOTAL DEGREE HOURS: 120

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

The Computer Science program focuses on the design, development, and application of software systems. Additional course work in algorithms, discrete structures, object oriented design, data structures, operating systems, digital logic design, computer architecture, and a wide range of advanced electives extend and supplement the core.

Mission Statement

In keeping with the mission of the College of Engineering, the Department of Computer Science and Engineering strives for excellence in teaching, research, and public service. Specifically, the Department aspires to:

1. Lead the advancement of computer science, computer engineering, and information technology through internationally recognized research and graduate education, as well as technology transfer to regional industries.
2. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning.
3. Educate students in the best practices of the field as well as integrate the latest research into the curriculum.
4. Foster the development of problem solving and communication skills as an integral component of the profession.
5. Provide quality learning experiences through small classes, active learning styles of teaching, and opportunities for meaningful interactions between students and faculty.

Objectives

The Department of Computer Science and Engineering has established the following program educational objectives for the computer science graduates of the Department.

1. Our computer science graduates will apply their knowledge and skills to succeed in their career and/or obtain an advanced degree.
2. Our graduates will function ethically and responsibly, and will remain informed and involved as full participants in our profession and our society.
3. Our graduates will successfully function in multi-disciplinary teams.
4. Our graduates will apply basic principles and practices of computing grounded in mathematics and science to successfully complete software related projects to meet customer business objectives and/or productively engage in research.

Entrance and Continuation Requirements for the Computer Science Program

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Computer Science. Prior to being admitted to a program, a student may take no more than two Departmental courses.

Minimum Admission Requirements for the Computer Science Program

1. Completion of:
 - o English Composition I (ENC 1101) and English Composition II (ENC 1102)
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)

All students must complete the equivalent of USF Composition I & II, Engineering Calculus I & II and Calculus-based General Physics I & II (with labs) with minimum grades of C in each course (grades of C- are insufficient). The minimum overall average GPA in these six courses required for admission to the Department is between 3.0 and 3.5 for any given year. The minimum acceptable average GPA will be posted on the Department's website one year prior to the Fall Semester that the revised GPA is applicable. The computed GPA is based on the best attempts in these courses.

2. Completion of COP 2510 with a minimum grade of B (grade of B- is insufficient) or another introductory programming course covering a modern programming language, with an emphasis on programming concepts and design methodology with a minimum grade of B (grade of B- is insufficient).
3. A minimum overall GPA of 2.0
4. A minimum USF GPA of 2.0

Minimum Continuation Requirements for the Computer Science Program

Students meeting the above requirements may be admitted to either of the Computer Science or Computer Engineering degree tracks; however, continuation in the program will be allowed only for students who complete CDA 3103 and COP 3514 with minimum grades of B, based on best attempts in each course (grades of B- are insufficient). These requirements must be met with a maximum of two attempts allowed for each course.

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GPA and Grade Requirements

Unless otherwise stated, the minimum acceptable grade in all BSCS required math, science, and engineering courses is a C or higher (C- is insufficient). The minimum acceptable grade in specialization courses is a C-, except as stated in the program admission and continuation requirements. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Departmental Policies

In addition to the College's graduation requirements, the Department has the following policies:

1. Mandatory academic advising and/or mentoring of students.
2. Exit interview and/or survey as a graduation requirement.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to the Department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

COP XXXX Introductory Programming in C, C++, Java, or equivalent language

MAC X311 Calculus I or MAC X281

MAC X312 Calculus II or MAC X282

PHY X048/X048L General Physics I with Lab or PHY X048C

PHY X049/X049L General Physics II with Lab or PHY X049C

XXX XXXX Six credit hours of science courses for science majors

REQUIREMENTS FOR THE MAJOR IN COMPUTER SCIENCE

TOTAL MAJOR HOURS: 96

Major requirements for the B.S.C.S. Degree:

Major Core (72 hours)

Math and Science (20 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I

MAC 2282 Engineering Calculus II or MAC 2312 Calculus II

MAC 2283 Engineering Calculus III or MAC 2313 Calculus III

PHY 2048 General Physics I

PHY 2048L General Physics I Laboratory

PHY 2049 General Physics II

PHY 2049L General Physics II Laboratory

Basic Engineering (6 credit hours)

EGN 3000 Foundations of Engineering

EGN 3000L Foundations of Engineering Lab

EGN 3443 Probability and Statistics for Engineers

EGN 4450 Introduction to Linear Systems

Specialization (37 credit hours)

COP 2510 Programming Concepts

COP 3514 Program Design

COP 3331 Object-Oriented Software Design

COP 4530 Data Structures

COP 4600 Operating Systems

CDA 3103 Computer Organization

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CDA 3201 Computer Logic and Design
CDA 3201L Computer Logic Design Lab
CDA 4205 Computer Architecture
CEN 4020 Software Engineering
COT 3100 Introduction to Discrete Structures
COT 4400 Analysis of Algorithms
CIS 4250 Ethical Issues and Professional Conduct (CPST)

Composition and Technical Writing (9 credit hours)

ENC 1101 Composition I
ENC 1102 Composition II
ENC 3246 Communication for Engineers (WRIN)

Major Electives (24 hours)

Departmental upper-level technical electives are classified as “software”, “hardware”, and “theory”. Computer Science students must choose 6 hours of software electives, 3 hours of theory electives, and an additional, non-overlapping 15 hours of electives in the Department. A maximum of six (6) hours combined of CIS 4900 and/or any other supervised individual study (that is, CIS 4915 and CIS 4940) are allowed as Departmental upper-level technical electives.

Software Electives:

CAP 4034 Computer Animation Fundamentals
CAP 4063 Web Application Design
CAP 4401 Image Processing Fundamentals
CAP 4410 Computer Vision
CAP 4662 Introduction to Robotics
CAP 4800 Systems Simulation
CEN 4020 Software Engineering
CEN 4072 Software Testing
CEN 4721 User Interface Design
CIS 4364 Cryptology and Information Security
CNT 4004 Computer Networks I
CNT 4411 Computing and Network Security
CNT 4504 Computer Networks II
COP 3257 JAVA Experienced Programmers
COP 4020 Programming Languages
COP 4365 Software Systems Development
COP 4620 Compilers
COP 4656 Software Development for Mobile Devices
COP 4710 Database Design

Hardware Electives:

CDA 4203/CDA 4203L Computer System Design & Lab
CDA 4213/CDA 4213L CMOS-VLSI Design & Lab
CDA 4253 FPGA Design and Analysis
CDA 4621 Control of Mobile Robots

Theory Electives:

COT 4115 Advanced Discrete Structures with Cryptology
COT 4210 Automata Theory and Formal Languages
COT 4521 Computational Geometry

Other Courses:

CIS 4900 Independent Study
CIS 4910 Senior Project
CIS 4915 Supervised Research
CIS 4940 Industry Internship

The Department website undergraduate section contains the most up to date list of Departmental upper-level technical electives. The prerequisite for most (but not all) Departmental upper-level technical electives is CDA 3201 Computer Logic and Design and COP 4530 Data Structures. Consult with the Department Undergraduate Advisor to learn more about available electives and which courses will and will not count towards the degree. Additional electives may be available with a special topics course number (typically, CIS 4930).

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

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Course Grade Requirement

Continuation in the major requires successful completion of CDA 3103 and COP 3514 with minimum grades of B, based on best attempts in each course. Grades of B- are insufficient. These requirements must be met with a maximum of two attempts allowed for each course.

Grading Requirement

Unless otherwise stated, the minimum acceptable grade in all BSCS required math, science, and engineering courses is a C or higher (C- is insufficient). The minimum acceptable grade in specialization courses is a C-, except as stated in the program admission and continuation requirements.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and CIS 4250 or by completing an A.A. degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math courses required for this major fully meet the math requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- CIS 4250 Ethical Issues and Professional Conduct (CPST)

Research Opportunities

The Research Experiences for Undergraduate Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Professors and graduate students serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912 or IDS 4914 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the College of Engineering and pursue actual internships during their sophomore, junior and senior years. **See the Department undergraduate advisor for more information on earning academic credit for internships.**

Accreditation Information

The Bachelor of Science degree program in Computer Science is accredited by the Computing Accreditation Commission of ABET, <http://www.abet.org>.

Advising Information

Department Undergraduate Advisor: <http://www.usf.edu/engineering/cse/undergraduate/contacts.aspx>

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COMPUTER SCIENCE FACULTY

Chair: S. Sarkar; *Distinguished Professors:* L. Hall; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegl, S. Sarkar, A. Weitzenfeld; *Associate Professors:* S. Chellappan, A. Gaspar, A. Iamnitshi, S. Katkooori, J. Ligatti, X. Ou, Y. Sun, Y. Tu, H. Zheng; *Assistant Professors:* Y. Liu, P. Rosen; *Instructor II:* S. Fang, P. Ventura, J. Wang; *Instructor I:* W. Hendrix, I. Hidalgo, H. Jeanty, V. Korzhova, S. Small, R. Tindell, Y. Zhang; *Distinguished Professor Emeritus:* A. Kandel, N. Ranganathan; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

• B.S.E.E. - ELECTRICAL ENGINEERING (EEL) (CIP = 14.1001 - TRACK 1 OF 2) TOTAL DEGREE HOURS: 128

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

The Electrical Engineering program offers study in all areas fundamental to the analysis, design, and development of electrical devices and systems. The areas covered by the program include foundational topics such as circuits and electrical power, to applications such as Internet of Things, Smart Grid and Data Analytics. The program offers curriculum tracks that include: Bioelectrical Systems, Communication Systems, Energy, Power and Sustainability, Mechatronics, Robotics and Embedded Systems, Wireless Systems and Micro and Nano-scale Systems. Additional information on these areas may be found at: <http://www.usf.edu/engineering/ee/documents/trackdescriptions.pdf/tracks>. Well-equipped laboratories reinforce fundamental concepts, while providing real world hands-on exposure.

Mission Statement

The mission of the Electrical Engineering Department in the College of Engineering at the University of South Florida is to provide a high quality education in electrical engineering for our students and practicing professionals; create new knowledge and solve real world problems via innovative research, and disseminate this information for the benefit of society; and to engage in effective regional, national and international service and outreach.

Program Educational Objectives

The Electrical Engineering Department in the College of Engineering at the University of South Florida is committed to graduating electrical engineers who shall within a few years of graduation:

- Demonstrate a progression in technical competence and increasing responsibility in the practice of engineering.
- Engage in written and oral professional communication within and beyond the engineering community.
- Continue to develop professionally through life-long learning, advanced education, and other creative pursuits in science and technology.

Please refer to the mission statement on the department website for additional information.

Entrance and Continuation Requirements for the Electrical Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Electrical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Minimum Admission Requirement for the Electrical Engineering Department

- Completion of:
 - Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and CHS 2440L)
- A minimum grade of C in each course and a 2.75 GPA based upon the best attempt in these courses for guaranteed admission to the department, OR a 2.5 GPA based upon the best attempt in these courses for a conditional admission to the department pending review of complete transcript.
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

Minimum Continuation Requirement for the Electrical Engineering Department

Continuation in the major requires successful completion of Differential Equations with a grade of B (not B-) or higher (best attempt).

GPA and Grade Requirement

Unless otherwise stated, the minimum acceptable grade in BSEE required math, science, engineering and specialization courses is a C or higher (C- is insufficient). Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

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Departmental Policies

In addition to the College's graduation requirement, the department has the following policies:

1. Students must consult with an academic advisor for the development of their individual academic study plan, and selection and approval of their Electrical Engineering Technical Electives.
2. Students must complete Exit interviews as a graduation requirement.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to the department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

Courses at a Florida College System Institution

MAC X311 or MAC X281
MAC X312 or MAC X282
MAC X313 or MAC X283
MAP X302 or MAP X305

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHS 2440/CHS 2440L General Chemistry for Engineers with Lab
PHY 2048/PHY 2048L General Physics I - Calculus Based with Lab
PHY 2049/PHY 2049L General Physics II - Calculus Based with Lab

Courses at a Florida College System Institution

CHM X045/X045L or CHM X045C or CHS X440/X440L
PHY X048/X048L or PHY X048C or PHY X043/X048L
PHY X049/X049L or PHY X049C or PHY X044/X049L

REQUIREMENTS FOR THE MAJOR IN ELECTRICAL ENGINEERING

TOTAL MAJOR HOURS: 107

Major requirements for the B.S.E.E. Degree:

Major Core (107 hours)

Math and Science (27 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
MAP 2302 Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems
CHM 2045 General Chemistry I or CHS 2440 Chemistry for Engineers
CHM 2045L General Chemistry I Laboratory or CHS 2440L Chemistry for Engineers Lab
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
EEL 3472C Electrical Engineering Science II - Electromagnetics or
PHY 2049 General Physics II and PHY 2049L General Physics II Laboratory

Note: EEL 3472C is strongly recommended but PHY 2049/L is accepted.

Basic Engineering (7 credit hours)

EGN 3000 Foundations of Engineering

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EGN 3000L Foundations of Engineering Laboratory
EGN 3443 Probability and Statistics for Engineers
EGN 3615 Engineering Economics with Social and Global Implications (required FKL Social and Behavioral Elective)

Program Core (37 credit hours)

Required Core (25 credit hours)

EEE 3394 Electrical Engineering Science I - Electronic Materials
EEL 2161 Programming with C
EEL 3115L Laboratory I
EEL 3163C Computer Tool Laboratory
EEL 3705 Fundamentals of Digital Circuits
EEL 3705L Fundamentals of Digital Circuits Laboratory
EEL 4102 Signals and Systems
EGN 3373 Introduction to Electrical Systems I
EGN 3374 Introduction to Electrical Systems II
EGN 3420 Engineering Analysis

Elective Core (12 credit hours)

Students must choose four (4) out of the six (6) courses listed below. Each course serves as a "gateway" to the Technical Tracks (see technical tracks and technical electives lists below).

EEE 3302 Electronics I (Gateway Course for Technical Track #1)
EEL 4512C Introduction to Communication Systems (Gateway Course for Technical Track #2)
EGN 3375 Electromechanical systems (Gateway Course for Technical Track #3)
EEL 4657 Linear Control Systems (Gateway Course for Technical Track #4)
EEL 4423C Wireless Circuits & Systems Design Laboratory (Gateway Course for Technical Track #5)
EEE 4351C Semiconductor Devices (Gateway Course for Technical Track #6)

Program Specialization (14 credit hours)

Students must choose a minimum of two (2) technical tracks as areas of specialization and select at least two (2) 3-credit hour courses and one (1) 1-credit hour laboratory from courses listed under each track. Courses cannot be double counted across tracks.

See Track and Technical Electives lists below; graduate-level courses are also available under each track area.

Track 1: Bioelectrical Systems

EEE 4260C Bioelectricity
EEE 4410 System on a Chip
EEE 4506 Biomedical Image Processing
EEL 3116L Laboratory II
EEL 4271 Bioelectronics

Track 2: Communication Systems

EEE 4305 Communications Electronics
EEL 4595 Mobile and Personal Communication
EEL 4727C Digital Signal Processing with Field Programmable
EEL 4756 Digital Signal Processing
EEL 4936 Wireless Communications Lab

Track 3: Energy, Power, and Sustainability

EEL 4212 Energy Delivery Systems
EEL 4214 Electric (Utility) Distribution Systems
EEL 4224 Electric Machines and Drives
EEL 4241 Power Electronics
EEL 4251 Power System Analysis
EEL 4252 Power Systems II
EEL 4271 Power System Protection
EEL 4283 Sustainable Energy
EEL 4295 Power Quality
EEL XXXX Laboratory

Track 4: Mechatronics, Robotics, and Embedded Systems

EEL 3100 Network Analysis and Design
EEL 3924 Makecourse-Art: Leonardo in the New Millennium
EEL 4657L Linear Control Systems Laboratory
EEL 4740 Embedded Systems
EEL 4743L Microprocessor Laboratory
EEL 4744 Microprocessor Principles and Applications
EGN 3060 Mechatronics for Innovation

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Track 5: Wireless Circuits and Systems

EEL 4420 RF & Microwave Measurements
EEL 4421 RF/Microwave Circuits I
EEL 4422 RF/Microwave Circuits II
EEL 4461 Antenna Theory

Track 6: Micro and Nano-scale Systems

EEE 3302 Electronics I
EEE 4274 MEMS I: Chemical/Biomedical Sensors and Microfabrication
EEE 4301 Electronics II
EEE 4359 Analog CMOS/VLSI Design
EEL 3116L Laboratory II
EEL 4567 Electro-Optics
EEL XXXX Laboratory

Program Electives (13 credit hours)

Select 13 credit hours of course and laboratory work from any of the Electrical Engineering upper-level (3000- or 4000-level) courses listed in the Undergraduate Catalog. Students may choose more coursework under the two specialization tracks, or choose breadth over depth by choosing courses in other Electrical Engineering areas.

One 3-credit hour course may be taken outside of the Electrical Engineering department, with prior department approval.

Capstone Design Sequence (6 credit hours)

EEL 4906 EE Design I
EEL 4914 EE Design II (CPST)

Technical Writing (3 credit hours)

ENC 3246 Communication for Engineers (WRIN)

Entrance Requirements for the Electrical Engineering Program

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Electrical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Minimum Admission Requirements for the Electrical Engineering Department

- Completion of:
 - Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and CHS 2440L)
- A minimum grade of C in each course and a 2.75 GPA based upon the best attempt in these courses for guaranteed admission to the department, OR a 2.5 GPA based upon the best attempt in these courses for a conditional admission to the department pending review of complete transcript.
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

Minimum Continuation Requirements for the Electrical Engineering Department

Continuation in the major requires successful completion of Differential Equations with a grade of B (not B-) or higher (best attempt).

Departmental Policies

In addition to the College's graduation requirement, the department has the following policies:

1. Students must consult with an academic advisor/mentor for the development of their individual academic study plan, and selection and approval of their Electrical Engineering Technical Electives. To schedule an appointment send an email to: ENG-EEAdvising@usf.edu
2. Students must complete Exit interviews as a graduation requirement.

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Course Grade Requirement

Continuation in the major requires successful completion of Differential Equations with grades of B (not B-) or higher (best attempt).

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Grading Requirement

Unless otherwise stated, the minimum acceptable grade in BSEE required math, science, engineering and specialization courses is a C or higher (C- is insufficient).

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and by selecting one technical or Foundation of Knowledge and Learning elective that is an approved State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) course or by completing an AA degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course. The credits earned for chemistry required by this major may count toward the FKL science requirement.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- EEL 4914 EE Design II (CPST)

Research Opportunities

The Research Experiences for Undergraduate Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Graduate students and professors serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912, IDS 4914 or IDH 4910 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the engineering college and pursue actual internships during their sophomore, junior, and senior years.

Accreditation Information

The Bachelor of Science degree program in Electrical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Advising Information

All incoming freshman and transfer students must meet with one of the college advisors in the Engineering Student Services (ESS).

Engineering Student Services

Office: Engineering Building III (ENC) 1302

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Phone: (813) 974-2684

Email: eng-advisingmail@usf.edu

Website

Students accepted into the EE Department should meet with Dr. Wiley, the EE Department Undergraduate Program Director, with any questions.

Dr. Paris Wiley, Program Director, wiley@usf.edu, Engineering Building II (ENB) 379C, (813) 974-2369

Ms. Cherie Dilley, Academic Services Administrator, cdilley@usf.edu, Engineering Building II (ENB) 379E, (813) 974-2659

ELECTRICAL ENGINEERING FACULTY

Chairperson: T. Weller; Professors: H. Arslan, S. Bhanja, R. H. Bishop, J. Chang, K. Chen, L. Dunleavy, C. Ferekides, N. Ghani, R. Gitlin, A. Hoff, V. Jain, W. Moreno, D. Morel, S. Morgera, R. Sadow, R. Sankar, R. Schlaf, E. Stefanakos; Associate Professors: L. Fan, G. Mumcu, A. Takshi, S.W. Thomas, J. Wang, P.H. Wiley; Assistant Professors: S. Kose, Z. Lu, Z. Miao, A. Parthasarathy, I. Uysal, Y. Yilmaz; Instructors: A. Castellanos, C. Jeong, R. Fehr.

• B.S.I.E. - INDUSTRIAL ENGINEERING (EIE) (CIP = 14.3501)

TOTAL DEGREE HOURS: 128

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

Industrial engineering (IE) is a field of study intended for individuals who are interested in formulating mathematical, statistical, and computer simulation models of complex systems in manufacturing, logistics, information, healthcare, transportation, financial, utilities, entertainment, and service. IEs connect big data sets and models to make engineering decisions for improving system performance and developing public policies. Unlike traditional disciplines in engineering, the scope of the industrial engineering field is very broad.

Mission Statement

The mission of the IMSE Department is to:

- Assure student success through a high quality education which integrates the latest research and practices of the field;
- Pursue excellence in interdisciplinary research and innovation;
- Engage with the profession and the community.

Program Educational Objectives

Our graduates are expected to:

- Have applied industrial engineering effectively and creatively
- Have demonstrated effective communication and teamwork
- Have engaged in community service and leadership
- Have continued to pursue life-long learning

Please see the mission statement on the department website for additional information.

Entrance Requirements for the Industrial Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Industrial Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental Engineering courses.

Minimum Admission Requirements for the Industrial Engineering Department

1. Completion of:
 - Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and CHS 2440L)

A minimum grade of C in each course and a 2.4 GPA based upon the best attempt in these courses.

2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

GPA and Grade Requirement

Unless otherwise stated, the minimum acceptable grade in all BSIE required math, science, engineering, and specialization courses is a C or higher (C- is insufficient). Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

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STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to the department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

Courses at a Florida College System Institution

MAC X311 **or** MAC X281
MAC X312 **or** MAC X282
MAC X313 **or** MAC X283
MAP X302 **or** MAP X305

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHS 2440/CHS 2440L General Chemistry for Engineers with Lab
PHY 2048/PHY 2048L General Physics I - Calculus Based with Lab
PHY 2049/PHY 2049L General Physics II - Calculus Based with Lab

Courses at a Florida College System Institution

CHM X045/X045L **or** CHM X045C **or**
CHS X440/X440L
PHY X048/X048L **or** PHY X048C **or** PHY X043/X048L
PHY X049/X049L **or** PHY X049C **or** PHY X044/X049L

REQUIREMENTS FOR THE MAJOR IN INDUSTRIAL ENGINEERING

TOTAL MAJOR HOURS: 107

Major requirements for the B.S.I.E. Degree:

Major Core (102 hours)

Math and Science (27 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
MAP 2302 Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems
CHS 2440 General Chemistry for Engineers or CHM 2045 General Chemistry I
CHS 2440L General Chemistry for Engineers Laboratory or CHM 2045L General Chemistry I Lab
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
PHY 2049 General Physics II
PHY 2049L General Physics II Laboratory

Basic Engineering (24 credit hours)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering Lab
EGN 3443 Probability & Statistics for Engineering
EGN 4450 Introduction to Linear Systems
EGN 1113 Introduction to Design Graphics
EGN 3311 Statics
EGN 3373 Introduction to Electrical Systems I
EGN 3365 Materials Engineering I
EGN 3343 Thermodynamics I

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EGN 3615 Engineering Economics with Social and Global Implications (required FKL Social and Behavioral Elective)

Specialization (48 credit hours)

ESI 4007 Engineering Programming
EIN 4312C Work Analysis
EIN 4621 Manufacturing Processes
ESI 4312 Deterministic O.R.
EIN 4333 Production Control
ESI 4221 Statistical Quality Control
ESI 4313 Probabilistic O.R.
ESI 4620 Design of Industrial Information Systems
ESI 4606 Engineering Analytics I
EIN 4364 Facilities Design and Cost Analysis
ESI 4244 Design of Experiments
ESI 4523 Systems Simulation
EIN 4243C Human Factors
EIN 4601C Automation and Robotics
EIN 4891 Capstone Design (CPST)
ESI 4607 Engineering Analytics II

Technical Writing (3 credit hours)

ENC 3246 Communication for Engineers (WRIN)

Major Electives (5 hours)

Five (5) credit hours of Departmental Upper-Level Electives (Industrial Engineering Technical Elective)

EIN 4142 Project Management
EIN 4172 ISO 9000/14000
EIN 4173 Quality Systems Management
EIN 4180 Principles of Engineering Management
EIN 4200 Creativity in Technology
EIN 4213 Engineering Systems Safety
EIN 4214 Occupational Safety Engineering
EIN 4385 Management of Technical Change
EIN 4453 Advanced Lean Six Sigma
EIN 4933 Special Topics in Industrial Engineering
EIN 5182 Principles of Engineering Management
EIN 5275 Work Physiology and Biomechanics
EIN 5510 Manufacturing Systems Analysis
ESI 4326 Engineering the Supply Chain
ESI 5236 Reliability Engineering
ESI 5522 Computer Simulation

Entrance Requirements for the Industrial Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Industrial Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental Engineering courses.

Admission Requirements for the Industrial Engineering Department

1. Completion of:
 - o Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282) and Calculus III (MAC 2313 or MAC 2283)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
 - o Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
 - o General Chemistry I with Lab (CHM 2045 and CHM 2045L) or (CHS 2440 and 2440L)

A minimum grade of C in each course and a 2.4 GPA based upon the best attempt in these courses.

2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Grading Requirement

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The minimum acceptable grade in all BSIE required math, science, engineering, and specialization courses is a C or higher (C- is insufficient).

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246, and EIN 4243C or by completing an AA degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course. The credits earned for chemistry required by this major may count toward the FKL science requirement.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- EIN 4891 Capstone Design (CPST)

Other Requirements

The Department has the following policies:

- Mandatory academic advising of students for each term,
- Exit interviews as a graduation requirement,
- Students are encouraged to take the FE Exam.

Research Opportunities

The Research Experiences for Undergraduate (REU) Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Graduate students and professors serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience. Contact Dr. Grisselle Centeno at gcenteno@usf.edu for further information on REU opportunities in Industrial Engineering.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the engineering college and pursue actual internships during their sophomore, junior, and senior years. The IMSE department strongly encourages all BSIE students to pursue internship opportunities, and provides continual information to students as new opportunities become available.

Industrial Engineering Accelerated Programs

Students majoring in Industrial Engineering have the option to pursue one of the following accelerated programs:

- B.S.I.E. in Industrial Engineering and M.S.B.E. in Biomedical Engineering
- B.S.I.E. in Industrial Engineering and M.S.E.M. in Engineering Management

Accreditation Information

The Bachelor of Science degree program in Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

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Advising Information

Students who wish to declare Industrial Engineering as their major **must apply to be admitted into the department**. A department application and an IE flowchart with courses completed must be obtained from [Engineering Student Services](#) in Engineering Building III (ENC) 1302 prior to an initial advising appointment request in the department. This should be done when the four core prerequisites of EGN 1113 Introduction to Engineering Graphics, EGN 3443 Probability and Statistics for Engineers, EGN 4450 Linear Systems, and EGN 3615 Engineering Economics with Social and Global Implications have been satisfactorily completed, **and** the 2.4 GPA Math/Science entrance requirement is met. The first departmental advising session will be scheduled with the Undergraduate Director, Dr. Kingsley Reeves. Subsequently, the student will be assigned to an IE faculty as their permanent advisor for the remainder of their semesters until completion of their degree.

Visit <http://www.usf.edu/engineering/imse/about-us/contacts.aspx> for contact information.

INDUSTRIAL ENGINEERING FACULTY

Chairperson and Professor: T.K. Das; *Professors:* O.G. Okogbaa, J. Zayas-Castro; *Associate Professors:* G. Centeno, C. Kwon, S. Lai-Yuen, K. Reeves, A. Savachkin, M.X. Weng, A. Yalcin; *Assistant Professor:* M. Li; *Instructors:* S. Acharya, P. Anzalone, P. Schnitzler.

• B.S.I.T. - INFORMATION TECHNOLOGY (ITC) (CIP = 11.0103 (TRACK 1 OF 4)) TOTAL DEGREE HOURS: 120

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

The Information Technology major focuses on programming, databases, networking, human-computer interaction, web systems, and cybersecurity to meet the technology requirements of business, government, healthcare, education, and other organizations. Students in this major acquire the right combination of fundamental knowledge and practical expertise to solve computing technology problems and meet user needs. Currently, all Information Technology courses are online.

Mission Statement

In keeping with the mission of the College of Engineering, the Department of Computer Science and Engineering strives for excellence in teaching, research, and public service. Specifically, the Department aspires to:

1. Lead the advancement of computer science, computer engineering, and information technology through internationally recognized research and graduate education, as well as technology transfer to regional industries.
2. Prepare students for full and ethical participation in a diverse society and encourage lifelong learning.
3. Educate students in the best practices of the field as well as integrate the latest research into the curriculum.
4. Foster the development of problem solving and communication skills as an integral component of the profession.
5. Provide quality learning experiences through small classes, active learning styles of teaching, and opportunities for meaningful interactions between students and faculty.

Objectives

The Department of Computer Science and Engineering has established the following program educational objectives for information technology graduates of the Department.

1. Our information technology graduates will apply their knowledge and skills to succeed in their career and/or obtain an advanced degree.
2. Our graduates will function ethically and responsibly, and will remain informed and involved as full participants in our profession and our society.
3. Our graduates will successfully function in multi-disciplinary teams.
4. Our graduates will apply principles and practices of information technology to identify, implement, and maintain cost-effective technologies and apply fundamental computing knowledge to solve information technology problems.

Entrance and Continuation Requirements for the Information Technology Program

Students in good standing who have fully met the below admission requirements may declare a major in Information Technology. Prior to being admitted to a major, a student may be permitted to take no more than two departmental courses.

Minimum Admission Requirements for the Information Technology Program

1. Completion of:
 - o MAD 2104 Discrete Math

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- o CGS 1540 Introduction to Data Structures
- o COP 2512 Programming Fundamentals of IT
- o COP 2513 Object Oriented Programming for IT

with a minimum grade of C in each course (grades of C- are insufficient)

All students must complete the equivalent of USF Discrete Math (MAD 2104), Introduction to Databases for Information Technology (CGS 1540), Programming Fundamentals for IT (COP 2512), and Object Oriented Programming for IT (COP 2513) with minimum grades of C in each course (grades of C- are insufficient). The minimum overall average GPA in these four courses required for admission to the department is between 2.0 and 3.5 for any given year. The minimum acceptable average GPA will be posted on the department's website one year prior to the fall semester that the revised GPA is applicable. The computed GPA is based on the best attempts in these courses.

1. A minimum overall GPA of 2.0
2. A minimum USF GPA of 2.0

GPA and Grade Requirements

Unless otherwise stated, the minimum acceptable grade in all BSIT required math, science, and engineering courses is a C or higher (C- is insufficient). The minimum acceptable grade in state mandated prerequisite courses is a C or higher (C- is insufficient). The minimum acceptable grade in specialization courses is a C-, except as stated in the major admissions and continuation requirements. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Departmental Policies

In addition to the College's graduation requirements, the department has the following policies:

1. Mandatory academic advising and/or mentoring of students.
2. Exit interview and/or survey as a graduation requirement.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

The minimum acceptable grade in state mandated prerequisite courses is a C or higher (C- is insufficient).

- PSY XXXX Any Psychology course
- STA X023 Introductory Statistics I or STA X122
- ECO X013 Principles of Economics (Macroeconomics)
- CGS XXXX Any Database course
- COP XXXX Any Computer Programming course
- MAC XXXX Any Pre-Calculus course
- PHY XXXX Any Physics course
- XXXX XXXX Any Discrete Math course
- COP XXXX Any Object-Oriented Computer Programming course

REQUIREMENTS FOR THE MAJOR IN INFORMATION TECHNOLOGY

TOTAL MAJOR HOURS: 102

Major requirements for the B.S.I.T. Degree:

Major Core (84 hours)

Math and Science (16 credit hours)

- STA 2023 Introductory Statistics I
- MAC 1147 Precalculus Algebra and Trigonometry
- MAD 2104 Discrete Math
- PHY 2020 Conceptual Physics
- FKL Core Curriculum Natural Sciences Elective (CANL)

Breadth (9 credit hours)

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PSY 2012 Introduction to Psychological Science
ECO 2013 Economics Principles (Macroeconomics)
INR 3033 International Political Cultures

Basic Engineering (1 credit hour)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering Lab

Specialization (49 credit hours)

CEN 3722 Human Computer Interfaces for Information Technology
CGS 1540 Introduction to Databases for Information Technology
CGS 3303 Information Technology Concepts
CGS 3853 Web Systems for Information Technology
CIS 3213 Foundations of Cyber Security
CIS 3433 System Architecture and Integration for Information Technology
CIS 4083 Cloud Computing for Information Technology
CIS 4253 Ethics for Information Technology
CIS 4935 Senior Project in Information Technology (CPST)
CNT 4104 Computer Information Networks for Information Technology
CNT 4104L Computer Information Networks Laboratory for Information Technology
CNT 4603 System Administration and Maintenance for Information Technology
COP 2512 Programming Fundamentals for Information Technology
COP 2513 Object Oriented Programming for Information Technology
COP 3515 Advanced Program Design for Information Technology
COP 4538 Data Structures and Algorithms for Information Technology
COP 4703 Advanced Database Systems for Information Technology

Composition and Technical Writing (9 credit hours)

ENC 1101 Composition I
ENC 1102 Composition II
ENC 3246 Communication for Engineers (WRIN)

Major Electives (18 hours)

Students choose 18 credit hours of approved IT departmental electives from the following list:

CEN 4360 Mobile Applications Development for IT
CGS 3845 Electronic Commerce
CIS 4204 Ethical Hacking
CIS 4361 Information Assurance and Security Management for IT
CIS 4412 Resource Management for IT
CIS 4947 Industry Internship for IT
CNT 4403 Network Security and Firewalls
COP 3353 User-level introduction to Linux for IT
COP 4564 Application Maintenance and Debugging for IT
COP 4883 Java Programming for IT
CTS 4337 Linux Workstations System Administration for IT

The Department [website undergraduate section](#) contains the most up-to-date list of Departmental Electives. These posted lists also describe the required pre-requisites for the electives. Additional electives may be available with a special topics course number (typically, COP 4931). Consult with the Department Undergraduate Advisor to learn more about available electives. Students may earn up to 9 hours of CIS 4947 Industry Internship for Information Technology credit, no more than 3 hours in any one given company.

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Grading Requirement

Unless otherwise stated, the minimum acceptable grade in all BSIT required math, science, and engineering courses is a C or higher (C- is insufficient). The minimum acceptable grade in state mandated prerequisite courses is a C or higher (C- is insufficient). The minimum acceptable grade in a specialization course is a C-, except as stated in the program admission and continuation requirements.

Residency Requirement

Transfer students must complete a minimum number of approved major core courses in the major at USF. The minimum number of USF major core credit hours required is established by the respective academic department. In no

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case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246, and CIS 4253 or by completing an A.A. degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math courses required for this major fully meet the math requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- ENC 3246 Communication for Engineers (WRIN)
- CIS 4935 Senior Project in Information Technology (CPST)

Other Requirements

All Departmental courses for the Information Technology major are offered online; this may change in the future.

Research Opportunities

The Research Experiences for Undergraduate Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Professors and graduate students serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912 or IDS 4914 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the engineering college and pursue actual internships during their sophomore, junior, and senior years. See the **department undergraduate advisor for more information on earning academic credit for internships.**

Advising Information

Department undergraduate advisor: <http://www.usf.edu/engineering/cse/undergraduate/contacts.aspx>.

INFORMATION TECHNOLOGY FACULTY

Chair: S. Sarkar; *Distinguished Professors:* L. Hall; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegler, S. Sarkar, A. Weitzenfeld; *Associate Professors:* S. Chellappan, A. Gaspar, A. Iamnitich, S. Katkoori, J. Ligatti, X. Ou, Y. Sun, Y. Tu, H. Zheng; *Assistant Professors:* Y. Liu, P. Rosen; *Instructor II:* S. Fang, P. Ventura, J. Wang; *Instructor I:* W. Hendrix, I. Hidalgo, H. Jeanty, V. Korzhova, S. Small, R. Tindell, Y. Zhang; *Distinguished Professor Emeritus:* A. Kandel, N. Ranganathan; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

• B.S.M.E. - MECHANICAL ENGINEERING (EME) (CIP = 14.1901) TOTAL DEGREE HOURS: 128

<http://www.usf.edu/engineering/undergraduate/majors.aspx>

Students pursuing the Bachelor of Science in Mechanical Engineering program take coursework in thermodynamics, heat transfer, instrumentation, measurements, solid and fluid mechanics, dynamics, machine analysis and design,

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mechanical design, manufacturing processes, vibrations and controls. This is supplemented by elective coursework in such areas as sustainability, internal combustion engines, refrigeration and air conditioning, mechanical design, robotics, propulsion, computer-aided design, manufacturing, bio-engineering, alternative energy, thermal design, composite materials, and tribology. Laboratories are available for basic instrumentation, thermal and fluid sciences, solid mechanics, data acquisition, controls, CAD/CAE, and vibrations.

Graduates of this program are employed in design, manufacturing, contracting, operations, marketing, and management in virtually all segments of industry and government, including, but not limited to: aeronautics, aerospace and propulsion; automotive, internal combustion engines, fuel cells and transportation; propulsion systems; power generation; heating, ventilation and air conditioning; structures and machinery design; mining and oil exploration; paper, textile, food, and petrochemical industries/processing/manufacturing; micro and nano materials and semiconductors; and biomaterials and bioengineering. There are abundant career opportunities in a wide range of industries because mechanical equipment is required in every aspect of modern industry.

Mission Statement

The Mission of the Department of Mechanical Engineering in the College of Engineering at the University of South Florida is to provide a quality undergraduate and graduate education for students entering the mechanical engineering profession or seeking careers in related fields: to advance scientific knowledge through basic and applied research; to disseminate technical information through scholarly publications, conferences and continuing education; to advance the profession through service within the associated societies, and to promote activities which serve global development.

Undergraduate Program Educational Objectives

Our Graduates, within 3-5 years of graduation, will successfully:

1. Apply concepts of science, mathematics, computation, and engineering in their chosen profession.
2. Apply knowledge and skills essential to engineering processes, such as design, analysis, synthesis, fabrication and experimental techniques.
3. Demonstrate skills for professional interaction and leadership including multi-disciplinary collaboration, and effective oral and written communication.
4. Demonstrate continued career development as well as professional and ethical responsibility within the global, societal and economic context.

Entrance and Continuation Requirements for the Mechanical Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Mechanical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Minimum Admission Requirements for Department of Mechanical Engineering

1. Completion of the following courses with a cumulative 3.0 GPA based on best attempt and a minimum grade of C in each course:
 - o Calculus I (MAC 2311 or MAC 2281)
 - o Calculus II (MAC 2312 or MAC 2282)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

Minimum Continuation Requirements for Department of Mechanical Engineering

Completion of EML 3500 Mechanics of Solids and EGN 3343 Thermodynamics I with a minimum grade of C in each course (C- is insufficient).

GPA and Grading Requirement

The minimum acceptable grade in all BSME required math and science courses is a C or higher (C- is insufficient). The minimum acceptable grade in engineering and specialization courses which are prerequisites to other degree required courses is a C-, excepted as stated in the Department Continuation Requirements. The passing grade for terminal engineering and specialization courses is a D-. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

STATE MANDATED COMMON COURSE PREREQUISITES

Students wishing to transfer to USF should complete an A.A. degree at a Florida College System institution. Some courses required for the major may also meet General Education requirements thereby transferring maximum hours to the university.

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If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements.

Transfer students are also required to comply with the immunization, foreign language, and continuous enrollment policies of the university.

Students should complete the following prerequisite courses at the lower level prior to entering the university. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted.

Unless stated otherwise, a grade of C is the minimum acceptable grade in prerequisite courses.

Students qualify for direct entry to the department if they have completed the following courses at a Florida College System institution or University in the Florida State University System (SUS) and meet all other admissions requirements of the University and College.

Mathematics:

Courses at USF

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering Calculus III
MAP 2302 Differential Equations

Courses at a Florida College System Institution

MAC X311 **or** MAC X281
MAC X312 **or** MAC X282
MAC X313 **or** MAC X283
MAP X302 **or** MAP X305

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHS 2440/CHS 2440L General Chemistry for Engineers with Lab
PHY 2048/PHY 2048L General Physics I - Calculus Based with Lab
PHY 2049/PHY 2049L General Physics II - Calculus Based with Lab

Courses at a Florida College System Institution

CHM X045/X045L **or** CHM X045C **or**
CHS X440/X440L
PHY X048/X048L **or** PHY X048C **or** PHY X043/X048L
PHY X049/X049L **or** PHY X049C **or** PHY X044/X049L

REQUIREMENTS FOR THE MAJOR IN MECHANICAL ENGINEERING

TOTAL MAJOR HOURS: 107

Major requirements for the B.S.M.E. Degree:

Major Core (95 hours)

Note: Department prefers students take EGN 3615 to fulfill one of the FKL Social and Behavioral Sciences Elective requirement, otherwise it will fulfill one of the Upper-Level (Technical/Design) Departmental Electives.

Math and Science (27 credit hours)

MAC 2281 Engineering Calculus I or MAC 2311 Calculus I
MAC 2282 Engineering Calculus II or MAC 2312 Calculus II
MAC 2283 Engineering Calculus III or MAC 2313 Calculus III
MAP 2302 Differential Equations
CHS 2440 General Chemistry for Engineers or CHM 2045 General Chemistry I
CHS 2440L General Chemistry for Engineers Laboratory or CHM 2045 General Chemistry I Laboratory
PHY 2048 General Physics I
PHY 2048L General Physics I Laboratory
PHY 2049 General Physics II
PHY 2049L General Physics II Laboratory

Basic Engineering (22 credit hours)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering Laboratory
EGN 3311 Statics
EGN 3321 Dynamics
EGN 3615 Engineering Economics with Social and Global Implications
EGN 3365 Materials Engineering I
EGN 3373 Introduction to Electrical Systems I
EGN 3343 Thermodynamics I
EGN 3443 Probability & Statistics for Engineers

Specialization (43 credit hours)

EML 3035 Programming Concepts for Mechanical Engineers
EML 3500 Mechanics of Solids

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EML 3022 Computer Aided Design and Engineering (CAD)
EML 3041 Computational Methods
EML 3262 Kinematics and Dynamics of Machinery
EML 3701 Fluid Systems
EML 4325 Mechanical Manufacturing Processes
EML 3303 Mechanical Engineering Lab I
EML 4123 Heat Transfer
EML 4501 Machine Design
EML 4106C Thermal Systems and Economics
EML 4220 Vibrations
EML 4302 Mechanical Engineering Laboratory II
EML 4312 Mechanical Controls
EML 4551 Capstone Design (CPST)

Technical Writing (3 credit hours)

ENC 3246 Communication for Engineers (WRIN)

Major Electives (12 hours)

12 hours of Upper-Level Departmental Electives (Technical Design Elective) from the list below:

BME 4332 Cell and Tissue Engineering
BME 4440 Introduction to Bioastronautics
EAS 4121 Hydro and Aerodynamics
EGN 4366 Materials Engineering II
EML 4141 Thermal Management of Electronic Systems
EML 4230 Introduction to Composite Materials
EML 4246 Tribology
EML 4310 Microcontrollers
EML 4326 Advanced Materials Processing
EML 4414 Power Plant Engineering
EML 4419 Propulsion I
EML 4421 Internal Combustion Engines
EML 4450 Alternative & Renewable Energy
EML 4503 Sustainable Design and Materials
EML 4552 Senior Mechanical Design
EML 4575 Principles of Fracture Mechanics
EML 4593 Haptics
EML 4601 Air Conditioning Design
EML 4702 Fluid Dynamics II
EML 4703 Mechanics of Compressible Fluids
EML 4905 Independent Study
EML 4930 Special Topics in Mechanical Engineering
OSE 4601 Optical Product Technology

Entrance and Continuation Requirements for the Mechanical Engineering Department

College of Engineering students who have fully met the below admission requirements and are in good academic standing, may declare a major in Mechanical Engineering. Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Minimum Admission Requirements for Department of Mechanical Engineering

1. Completion of the following courses with a cumulative 3.0 GPA based on best attempt and a minimum grade of C in each course:
 - o Calculus I (MAC 2311 or MAC 2281)
 - o Calculus II (MAC 2312 or MAC 2282)
 - o Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

Minimum Continuation Requirements for Department of Mechanical Engineering

Completion of EML 3500 Mechanics of Solids and EGN 3343 Thermodynamics I with a minimum grade of C in each course (C- is insufficient).

GPA and Grade Requirements

The minimum acceptable grade in all BSME required math and science courses is a C or higher (C- is insufficient). The minimum acceptable grade in engineering and specialization courses which are prerequisites to other

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degree required courses is a C-, excepted as stated in the Department Continuation Requirements. The passing grade for terminal engineering and specialization courses is a D-. Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

GPA Requirements

Students must have and maintain a minimum 2.0 Math and Science GPA, 2.0 Engineering GPA, 2.0 Specialization GPA, 2.0 USF GPA, and 2.0 Overall GPA.

Course Grade Requirement

Continuation requires completion of EML 3500 Mechanics of Solids and EGN 3343 Thermodynamics I with a minimum grade of C in each course (C- is insufficient).

Grading Requirement

The minimum acceptable grade in all BSME required math and science courses is a C or higher (C- is insufficient). The minimum acceptable grade in engineering and specialization courses which are prerequisites to other degree required courses is a C-, except as stated in the Department Continuation Requirements. The passing grade for terminal engineering and specialization courses is a D-.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major at USF. The minimum number of USF specialization credit hours required is established by the respective academic department. In no case will this be less than 18 hours. Basic engineering courses are not considered specialization courses. The University residency requirement must also be met.

A co-degree (concurrent) student must meet the requirements of each major and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

State Communication and Computation Requirement (formerly Gordon Rule)

The State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and by selecting one Foundation of Knowledge and Learning elective that is a State Communication Requirement (formerly known as Gordon Rule Communication) and State Computation Requirement (formerly known as Gordon Rule Computation) course or by completing an AA degree at a Florida College System institution.

Foundations of Knowledge and Learning (FKL) Requirement

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Knowledge and Learning core curriculum.

Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course. The credits earned for chemistry required by this major may count toward the FKL science requirement.

Foundations of Knowledge and Learning (FKL) Exit Requirement

- EML 4551 Capstone Design (CPST)
- ENC 3246 Communication for Engineers (WRIN)

Research Opportunities

The Research Experiences for Undergraduate Students program in the USF College of Engineering offers undergraduate students an opportunity to directly participate in state-of-the-art research. Graduate students and professors serve as research partners and mentors as undergraduate research assistants participate in the scientific process and gain relevant experience.

There are a number of options to receive academic credit for a mentored research experience and to have the experience show on the official transcript. Students who wish to enroll in an undergraduate research course should consult with their academic advisor to understand how the credit will apply towards the degree requirements. If no credit is needed, students may be eligible to enroll in the 0-credit IDS 2912 or IDS 4914 courses. These courses will not impact degree credits or GPA but will show on an official transcript and document the experience.

Internship Opportunities

The College of Engineering and USF's Career Services Cooperative Education (Co-Op) program provides services for students interested in experiential educational experiences. A wide variety of industries and government agencies offer internships and cooperative education employment opportunities for engineering students. Participants gain

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valuable expertise in practical applications and other aspects of operations and development in a professional engineering environment. Students normally apply for participation in this program during their first year in the engineering college and pursue actual internships during their sophomore, junior, and senior years.

Mechanical Engineering Accelerated Programs

Students majoring in Mechanical Engineering have the option to pursue one of the following accelerated programs:

- B.S.M.E. in Mechanical Engineering and M.S.B.E. in Biomedical Engineering
- B.S.M.E. in Mechanical Engineering and M.M.E. in Mechanical Engineering
- B.S.M.E. in Mechanical Engineering and M.S.M.E. in Mechanical Engineering
- B.S.M.E. in Mechanical Engineering and M.S.E.M. in Engineering Management
- B.S.M.E. in Mechanical Engineering and M.S.M.S.E. in Materials Science and Engineering

Accreditation Information

The Bachelor of Science degree program in Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

Advising Information

<http://www.usf.edu/engineering/me/undergraduate/index.aspx>.

Dr. D. Hess, Professor & Undergraduate Advisor, 813-974-2280, Engineering Building III (ENC) 2205.

MECHANICAL ENGINEERING FACULTY

Chairperson: R. Dubey; *Professors:* R. Dubey, D. Hess, A. Kaw, A. Kumar, J. Porteiro; *Associate Professors:* G. Besterfield, N. Crane, C. Lusk, N. Gallant, R. Guldiken, K. Reed, A. Volinsky, S. Wilkinson; *Assistant Professors:* W. Cai, D. Murphy, T. Yucelen; *Instructor:* J. Dixon, J. Gaines, A. Mujumdar, F. Pyrtle III; *Adjunct:* D. Dekker; *Professors Emeritus/a:* D. Durham, L. Scott, W. Smith, S. Ying.

MINOR IN BIOMEDICAL ENGINEERING (EBI)

TOTAL MINOR HOURS: 15

<http://www.usf.edu/engineering/undergraduate/minors.aspx>

The Biomedical Engineering minor is open to all Engineering majors and other students who meet the prerequisites listed below. For Engineering majors, at least nine (9) credit hours beyond the B.S. in any Engineering discipline must be completed for the Biomedical Engineering minor.

Student must register with the Department of Chemical & Biomedical Engineering's undergraduate advisor prior to starting this minor.

REQUIREMENTS FOR THE MINOR IN BIOMEDICAL ENGINEERING

This Biomedical Engineering minor is a 15-credit hour program that is open to all Engineering majors and other students who meet the prerequisites listed under additional minor requirements.

Minor Core (6 hours)

BME 4100 Biomedical Engineering

BME 4406 Engineering of Biological Systems

Minor Electives (9 hours)

The remaining 9 credit hours can be taken from the following list:

BCH 3023 Introductory Biochemistry or BCH 3053 General Biochemistry

BME 4332 Cell and Tissue Engineering

BME 4440 Introduction to Bioastronautics

BME 4409 Engineering Physiology

BME 4571 Nanomedicine

BME 4931 Selected Topics in Biomedical Engineering**

BME 5040 Pharmaceutical Engineering

BME 5320 Theory and Design of Bioprocesses

BME 5937 Selected Topics in Biomedical Engineering**

ECH 4931 Special Topics in Chemical Engineering*

ECH 5748 Selected Topics in Biomedical Engineering**

EEE 4274 Chemical/Bio Sensors & Microfabrication

EEE 4506 Biomedical Image Processing

EIN 4243C Human Factors

PHZ 4702 Applications of Physics to Biology & Medicine I

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PHZ 4703 Applications of Physics to Biology & Medicine II

*The list of approved special topics courses is below.

ECH 4931 Bioseparations

ECH 4931 Modern Biomedical Technologies

ECH 4931 Research Design Methods & Interpretations

ECH 4931 or EEL 4936 Bioelectricity

**Please see academic advisor for selected topics courses.

Prerequisite courses:

1. Biology I: BSC 2010
2. Calculus II: MAC 2282, MAC 2242, or MAC 2312
3. Physics II: PHY 2049 or PHY 2054
4. General Chemistry II: CHM 2046

Other Requirements

Student must register with the Department of Chemical & Biomedical Engineering undergraduate advisor prior to starting this minor program.

Advising Information

Scott W. Campbell (campbell@usf.edu)

MINOR IN COMPUTER SCIENCE (BCS)

TOTAL MINOR HOURS: 18

<http://www.usf.edu/engineering/undergraduate/minors.aspx>

The Computer Science minor covers key topics in the discipline and is an 18 credit hour program that is expected to be attractive to students in other Engineering departments and to students in Mathematics and the Sciences (including Physics, Chemistry, and Biology).

REQUIREMENTS FOR THE MINOR IN COMPUTER SCIENCE

The Computer Science minor is open to all students, except for students majoring in Computer Science, Computer Engineering, and Information Technology, who meet the prerequisites listed under Additional Minor Requirements.

Minor Core (12 hours)

COP 3514 Program Design

CDA 3103 Computer Organization

COP 3331 Object-Oriented Software Design

COP 4530 Data Structures

Minor Electives (6 hours)

The remaining six credit hours can be taken from electives offered by the Department of Computer Science and Engineering.

Students must register with the Department Undergraduate Advisor prior to starting this minor program. Consultation with the Department Undergraduate Advisor will ensure that students are informed of all offered courses. All catalog prerequisites and registration requirements must be met for enrollment in any of the courses required for the minor.

All students desiring to pursue the minor must meet the same entry and continuation requirements as a Departmental major.

Prerequisite courses (28 hours):

1. English Composition I and II (ENC 1101 and ENC 1102)
2. Calculus I (MAC 2311 or MAC 2281) and Calculus II (MAC 2312 or MAC 2282)
3. Calculus-based Physics I with Lab (PHY 2048 and PHY 2048L)
4. Calculus-based Physics II with Lab (PHY 2049 and PHY 2049L)
5. Programming Concepts (COP 2510) with a minimum grade of B (grade of B- is insufficient) or another introductory program course covering a modern programming language, with an emphasis on programming concepts and design methodology with a minimum grade of B (grade of B- is insufficient)
6. Introduction to Discrete Structures (COT 3100 or equivalent) is required

GPA Requirements

Successful completion of the minor requires a minimum 2.0 GPA in the above listed courses.

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Course Grade Requirement

Continuation in the minor requires successful completion of CDA 3103 and COP 3514 with minimum grades of B, based on best attempts in each course. Grades of B- are insufficient. These requirements must be met with a maximum of two attempts allowed for each course.

Other Information

Specialty tracks in hardware, software, theory, and many other areas can be defined in consultation with the Department Undergraduate Advisor. A specific pre-graduate school track (requiring a total of 21 hours) intended for students planning to seek admission into the Department graduate program has been defined as follows:

- COT 4400 Analysis of Algorithms
- COP 4600 Operating Systems
- CDA 4205 Computer Architecture

Advising Information

Department Undergraduate Advisor: <http://www.usf.edu/engineering/cse/undergraduate/contacts.aspx>

MINOR IN INFORMATION TECHNOLOGY (ITC)

TOTAL MINOR HOURS: 21

<http://www.usf.edu/engineering/undergraduate/minors.aspx>

The Information Technology minor covers key topics in the discipline and is a 21 credit hour program that is expected to be attractive to students in other Engineering departments and to students in Mathematics and the Sciences (including Physics, Chemistry, and Biology) who have no background in software development.

The Information Technology minor is open to all students, except for students majoring in Computer Science, Computer Engineering and Information Technology, who meet the prerequisites as listed below.

REQUIREMENTS FOR THE MINOR IN INFORMATION TECHNOLOGY

Minor Core (15 hours)

- CGS 1540 Introduction to Databases for Information Technology
- CGS 3303 IT Concepts
- COP 2512 Programming Fundamentals for Information Technology
- COP 2513 Object Oriented Programming for Information Technology
- COP 3515 Advanced Program Design for Information Technology

Minor Electives (6 hours)

Two Departmental electives of student's choice (in consultation with advisor) for which prerequisites have been met.

Students must register with the department undergraduate advisor prior to starting this minor program. Consultation with the department undergraduate advisor will insure that students are informed of all offered courses. All catalog prerequisites and registration requirements must be met for enrollment in any of the courses required for the minor. All students desiring to pursue the minor must meet the same entry and continuation requirements as a departmental major.

Students must register with the Department Undergraduate Advisor prior to starting this minor program. Consultation with the Department Undergraduate Advisor will ensure that students are informed of all offered courses. All catalog prerequisites and registration requirements must be met for enrollment in any of the courses required for the minor.

All students desiring to pursue the minor must meet the same entry and continuation requirements as a Departmental major.

Prerequisite for Required Course (3 credit hours):

Discrete Mathematics (MAD 2104 or equivalent) is required for Advanced Program Design (COP 3515)

GPA Requirements

Successful completion of the minor requires a minimum 2.0 GPA in the above listed courses.

Advising Information

Department Undergraduate Advisor: <http://www.usf.edu/engineering/cse/undergraduate/contacts.aspx>.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2017-2018 UNDERGRADUATE CATALOG

CERTIFICATE IN FOUNDATIONS OF CYBER SECURITY

TOTAL CERTIFICATE HOURS: 12

<http://www.usf.edu/engineering/cse/index.aspx>

This certificate covers a broad range of topics in Information Technology (IT) and Cybersecurity with a focus on practical tools for analyzing and protecting IT systems. Students completing the certificate will understand threats to IT systems and how to mitigate these threats. This certificate program is open to students from all majors except Department of Computer Science and Engineering majors (BSCS, BSCpE, and BSIT) – there are no prerequisite requirements to enter the certificate program.

REQUIREMENTS FOR THE CERTIFICATE IN FOUNDATIONS OF CYBER SECURITY

This certificate requires successful completion of four core courses - there are no elective courses. The four courses come from the BSIT program in the Department of Computer Science and Engineering. In rare cases, substitutions may be possible. Contact the Department Undergraduate Advisor for more information.

Certificate Core (12 hours)

CGS 1540 Introduction to Databases for Information Technology

CGS 3303 IT Concepts

CIS 3213 Foundations of Cyber Security

COP 2512 Programming Fundamentals for Information Technology

Note that the prerequisite for CGS 3303 is CGS 1540 (CGS 1540 has no prerequisite) and the prerequisite for CIS 3213 is COP 2512 (COP 2512 has no prerequisite). The certificate can typically be completed in one academic year.

GPA Requirements

A cumulative GPA of 2.0 in the certificate coursework is required.

Course Grade Requirement

A minimum grade of "C-" is required in each course in the certificate program.

Advising Information

Advising for this certificate program is from the undergraduate advisor in the Department of Computer Science and Engineering. See here: <http://www.usf.edu/engineering/cse/people/advisor.aspx>.