

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2015-2016 UNDERGRADUATE CATALOG

MISSION STATEMENT

The mission of the College of Engineering at the University of South Florida is to improve the quality of life in our community by:

- Providing a high-quality education for our students and practicing professionals;
- Creating new knowledge and solving real world problems via innovative research;
- Engaging in effective community service and outreach.

GOALS AND VALUES

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

The College provides technical assistance and technology transfer to the region, state and nation. In all facets of teaching, research and service, the College emphasizes close liaisons with industry and government to provide students and faculty with the skills and perspectives needed to ensure effective technological leadership and to achieve and sustain national recognition in focused areas of research.

The College of Engineering's faculty and staff value and promote a student-centric environment, innovation, collaboration, collegiality, commitment to continuous improvement, service to humanity and diversity. Through the support and emphasis of these values, the College leads by example and passes these attributes on to the students, empowering them to be creative and innovative engineering professionals in the 21st century as their work influences and impacts humanity.

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

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

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)

Minors

Biomedical Engineering (EBI)

Computer Science (BCS)

IT General Minor (ITG)

IT Technical Minor (ITE)

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.

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 Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Industrial Engineering, Information Technology, Mechanical Engineering. In addition, the College offers minors in Biomedical

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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/>.

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

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

(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.

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

1. 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.

Undergraduate Student Advising Information

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

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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.

Advising Center

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

Minimum Performance and Graduation 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 with student classifications of engineering and students who have been admitted to any academic department in the College 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 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 engineering 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. See "Entrance Requirements for the Academic Majors".

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.

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Graduation Application Procedures and Deadlines

Each College of Engineering student is required to complete an application for graduation and graduation check list. 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 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.

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.

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 Accelerated Graduate Program leading simultaneously to the Bachelor of Science in Engineering and Master of Science in Engineering degrees. The general basis of the accelerated program includes:

- The opportunity to take graduate-level courses during the fourth year.
- Up to twelve credit hours may be shared between the undergraduate and graduate degree, with approval from both the Undergraduate and Graduate Program Directors.

Students apply for admission to this program through their departmental advisor. Admissions requirements vary by department. Minimum application requirements:

- Senior standing (90 credits)
- At least 15 upper level engineering credits completed
- Meet or exceed the graduate program entrance requirements of the department.

• 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.

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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.
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.

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.

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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

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.

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Students should complete the following prerequisite courses listed below 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.

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/X049L

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 & 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
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
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

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ECH 4605 Product and Process Systems Engineering
 EMA 4003 Introduction to Materials Science
 ECH 4241L Chemical Engineering Laboratory II
 ECH 4323C 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 5937 Selected Topics in Biomedical Engineering
 ECH 4244L Chemical Engineering Lab III
 ECH 4905 Independent Study
 ECH 4931 Special Topics in Chemical Engineering II
 ECH 4936 Undergraduate Seminar
 ECH 5324 Automatic Process Control II
 ECH 5747C Selected Topics in Chemical Engineering Biotechnology
 ECH 5930 Special Topics III
 ECH 5931 Special Topics IV

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>ENC 1101</u> Composition I	3	<u>ENC 1102</u> Composition II	3
<u>CAGC FKL/Gen Ed Human and Cultural Diversity in a Global Context</u>	3	<u>CHM 2046</u> General Chemistry II	3
<u>CHM 2045</u> General Chemistry I	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>EGN 3000L</u> Foundations of Engineering Lab	1	<u>CHM 2046L</u> General Chemistry II Laboratory	1
<u>CHM 2045L</u> General Chemistry I Laboratory	1	<u>PHY 2048L</u> General Physics I Laboratory	1
! <u>EGN 3000</u> Foundations of Engineering		Semester Hours:	15
<u>CAFA FKL/Gen Ed Fine Arts</u>	3		
Semester Hours:	18		

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>EGN 3433</u> or <u>MAP 2302</u>	3
<u>SGEH</u> General Education Core Humanities	3	<u>EGN 3343</u> Thermodynamics I	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>CAHU FKL/Gen Ed Humanities (with HHCP)</u>	3
<u>PHY 2049L</u> General Physics II Laboratory	1	<u>CASB FKL/Gen Ed Social and Behavioral Sciences</u>	3
<u>ECH 3002</u> Introduction to Chemical & Biomedical Engineering	3	<u>ECH 3023</u> Material and Energy Balances	3
<u>ECH 3854</u> Chemical & Biomedical Engineering Computations	3	<u>ENC 3246</u> Communication for Engineers	3
Semester Hours:	17	Semester Hours:	18

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Summer		Credit Hours
<u>CHM 2210</u> Organic Chemistry I		3
<u>CHM 2210L</u> Organic Chemistry Laboratory I		2
Upper-Level Department Elective		3
Semester Hours:		8

Semester 5	Credit Hours	Semester 6	Credit Hours
<u>ECH 4123</u> Chemical Engineering Thermodynamics	3	<u>BME 4406</u> Engineering of Biological Systems	3
Upper-Level Department Elective	3	<u>ECH 3702</u> Instrument Systems I	3
<u>EMA 4003</u> Introduction to Materials Science	3	Upper-Level Department Elective	1
<u>ECH 3266</u> Transport Phenomena I	3	<u>ECH 4267</u> Transport Phenomena II	3
<u>ECH 4846</u> Numerical Methods in Chemical Engineering	3	<u>ECH 4418</u> Separation Processes	3
Semester Hours:	15	<u>SGES</u> General Education Core Social Sciences	3
		Semester Hours:	16

Summer	Credit Hours
Internship/Co-op Participation	
Semester Hours:	0

Semester 7	Credit Hours	Semester 8	Credit Hours
<u>ECH 3240L</u> Chemical Engineering Laboratory I	3	<u>ECH 4241L</u> Chemical Engineering Laboratory II	3
<u>ECH 4605</u> Product and Process Systems Engineering	3	<u>ECH 4323C</u> Process Dynamics and Control	3
Upper-Level Department Elective	3	<u>ECH 4615</u> Product and Process Design	3
<u>ECH 4504</u> Kinetics and Reaction Engineering	3	Upper-Level Department Elective	3
Semester Hours:	12	Semester Hours:	12

Gordon Rule Requirement

Gordon Rule (6A) is fully met through the mathematics courses above, ENC1101, ENC1102, ENC 3246 and by selecting one technical or Foundation of Knowledge and Learning General Education course that is an approved 6A communication course or by completing an AA degree at a Florida College System institution.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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.

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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.

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://chbme.eng.usf.edu/undergraduate/advisorsMessage.htm>.

CHEMICAL ENGINEERING FACULTY

Chairperson: V. Bhethanabotla; *Emeritus Professor:* J.C. Busot, J.A. Llewellyn, C.A. Smith; *Professors:* V.R. Bhethanabotla, S.W. Campbell, R. Frisina Jr., R. Gilbert, Y. Goswami, V. Gupta, B. Joseph, W.E. Lee, III, A.K. Sunol, *Associate Professors:* N. Alcantar, M. Jaroszeski C. Passaglia, R. Toomey; *Assistant Professors:* J. Kuhn, P. Korla, A. Pyayt; *Interdisciplinary Professors:* D. Edins, N. Gallant, A. Sagues, J.P. Walton; *Courtesy Faculty:* T. Fawcett, D. Haynie, J. Lloyd, D. McMillan, M. Peterson, G. Philippidis, W. Saadi, P. Sanberg, S. Sundaram.

• B.S.C.E. - CIVIL ENGINEERING (ECE) (CIP = 14.0801) TOTAL DEGREE HOURS: 131

<http://cee.eng.usf.edu/undergraduate/curriculum.htm>

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.

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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 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:
 - 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)

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.

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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

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.

Students should complete the prerequisite courses listed below at the lower level prior to entering the University. If these courses are not taken at the community college, they must be completed before the degree is granted. Unless stated otherwise, a grade of C is the minimum acceptable grade.

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.

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Some courses required for the major may also meet General Education Requirements thereby transferring maximum hours to the university.

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
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 2045/2045L General Chemistry I with Lab
CHS 2440/2440L General Chemistry for Engineers 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
PHY X048/X048L or PHY X048C or PHY X043/X048L
PHY X049/X049L or PHY X049C or PHY X044/X049L

Please be aware of the immunization, foreign language, and continuous enrollment policies of the university, as well as the qualitative standards required.

REQUIREMENTS FOR THE MAJOR IN CIVIL ENGINEERING

TOTAL MAJOR HOURS: 107

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

Major Core (92 hours)

Math and Science (27 credit hours)

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering 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
EGN 3331L Mechanics of Materials/Materials Lab
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
ENV 4001 Environmental Systems Engineering
TTE 4004 Transportation Engineering I
CES 3102 Structures I

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- 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)

- 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

Major Electives (15 hours)

15 hours of Departmental Upper-Level Electives (CE Concentration Elective).

The Program supports the following technical elective courses:

- CCE 4031 Construction Management
- CEG 4012 Geotechnical Engineering II
- CEG 5115 Foundation Engineering
- CES 4605 Concepts of Steel Design
- CES 4702 Concepts of Concrete Design
- CGN 4851 Concrete Construction Materials
- CGN 4933 Special Topics in Civil & Environmental Engineering**
- CWR 4540 Water Resources Engineering I
- CWR 4541 Water Resources Engineering II
- ENV 4417 Water Quality and Treatment
- SUR 2101C Engineering Land Survey
- TTE 4003 Transportation and Society
- TTE 4005 Transportation Engineering II

**Please see academic advisor for selected special topics courses.

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>CHM 2045</u> or <u>CHS 2440</u>	3	<u>ENC 1102</u> Composition II	3
<u>ENC 1101</u> Composition I	3	<u>PHY 2048</u> General Physics I - Calculus Based	3

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<u>SGES</u> General Education Core Social Sciences	3	<u>GLY 3850</u> Geology For Engineers	3
<u>CHM 2045L</u> or <u>CHS 2440L</u>	1	<u>EGN 1113</u> Introduction to Design Graphics	3
<u>EGN 3000L</u> Foundations of Engineering Lab	1	<u>PHY 2048L</u> General Physics I Laboratory	1
! <u>EGN 3000</u> Foundations of Engineering		<u>PHZ 2102</u> Highly Encouraged	1
Semester Hours:	15	Semester Hours:	18

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>EGN 3353</u> Basic Fluid Mechanics	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>EGN 3321</u> Dynamics	3
<u>EGN 4453</u> Numerical & Computer Tools I in Civil & Env Eng	3	<u>SGEH</u> General Education Core Humanities	3
<u>EGN 3311</u> Statics	3	<u>EGN 3331</u> Mechanics of Materials	3
<u>PHY 2049L</u> General Physics II Laboratory	1	<u>EGN 3331L</u> Mechanics of Materials Laboratory	1
<u>EGN 3365</u> Materials Engineering I	3	<u>EGN 3433</u> or <u>MAP 2302</u>	3
Semester Hours:	17	Semester Hours:	16

Summer

	Credit Hours
<u>ENC 3246</u> Communication for Engineers	3
<u>EGN 3615</u> Engineering Economics with Social and Global Implications	3
<u>CAGC FKL/Gen Ed</u> Human and Cultural Diversity in a Global Context	3
Semester Hours:	9

Semester 5	Credit Hours	Semester 6	Credit Hours
<u>ENV 4001</u> Environmental Systems Engineering	3	<u>CWR 4202</u> Hydraulics	3
<u>EGN 4454</u> Numerical & Computer Tools II in Civil & Env Eng	3	<u>EGN 3373</u> Introduction to Electrical Systems I	3
<u>EGN 3443</u> Probability and Statistics for Engineers	3	<u>CES 3102</u> Structures I	3
<u>EGN 3343</u> Thermodynamics I	3	<u>CAHU FKL/Gen Ed</u> Humanities (with HHCP)	3
<u>TTE 4004</u> Transportation Engineering I	3	CE Concentration Elective	3
Semester Hours:	15	<u>ENV 4004L</u> Environmental/Hydraulics Engineering Lab	1
		Semester Hours:	16

Summer

Internship/Co-op Participation	Credit Hours
Semester Hours:	0

Semester 7	Credit Hours	Semester 8	Credit Hours
<u>CAFA FKL/Gen Ed</u> Fine Arts	3	<u>CEG 4850</u> or <u>CES 4750</u> or <u>CWR</u> <u>4812</u>	3
<u>CEG 4011</u> Geotechnical Engineering I	3	CE Concentration Elective	3
CE Concentration Elective	3	CE Concentration Elective	3
CE Concentration Elective	3		

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<u>CEG 4011L</u> Geotechnical/Transportation Laboratory	1	<u>CGN 4122</u> Professional and Ethical Issues in Engineering	1
Semester Hours:	13	CASB FKL/Gen ED Social and Behavioral Sciences	2
		Semester Hours:	12

Gordon Rule Requirement

Gordon Rule (6A) is fully met through the mathematics courses required for the major, ENC1101, ENC1102, ENC 3246 and by selecting one technical or Foundation of Knowledge and Learning General Education course that is an approved 6A communication course or by completing an AA degree at a Florida College System institution.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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.

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.

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

Undergraduate Advising: <http://cee.eng.usf.edu/contactUs/contactUs.htm>.

CIVIL ENGINEERING FACULTY

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

• 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 issues of computer architecture and advanced topics in hardware design, including extensive laboratory work. Students in this program also acquire a broad background in engineering topics through related coursework in the College.

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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.

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 department, a student may be permitted to 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

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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.

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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

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.

Students should complete the following **prerequisite courses** listed below 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.

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 2045/2045L General Chemistry I with Lab
CHS 2440/2440L General Chemistry for Engineers with Lab
PHY 2048/2048L General Physics I - Calculus Based with Lab
PHY 2049/2049L 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: 97

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

Major Core (85 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

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Basic Engineering (15 credit hours)

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

Specialization (44 credit hours)

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

Major Electives (12 hours)

6 hours of Departmental Upper-Level Electives (CSE Hardware Elective)
6 hours of Departmental Upper-Level Electives (CSE Elective)

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>CHM 2045</u> or <u>CHS 2440</u>	3	<u>ENC 1102</u> Composition II	3
<u>ENC 1101</u> Composition I	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>SGES</u> General Education Core Social Sciences	3	<u>COP 2510</u> Programming Concepts	3
<u>CHM 2045L</u> or <u>CHS 2440L</u>	1	<u>PHY 2048L</u> General Physics I Laboratory	1
<u>EGN 3000L</u> Foundations of Engineering Lab	1	Semester Hours:	14
! <u>EGN 3000</u> Foundations of Engineering			
Semester Hours:	15		

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>CDA 3103</u> Computer Organization	3

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<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>SGEH</u> General Education Core Humanities	3
<u>COP 3514</u> Program Design	3	<u>COT 3100</u> Introduction to Discrete Structures	3
<u>CASB</u> FKL/Gen Ed Social and Behavioral Sciences	3	<u>EGN 3433</u> or <u>MAP 2302</u>	3
<u>PHY 2049L</u> General Physics II Laboratory	1	<u>COP 3331</u> Object Oriented Software Design	3
Semester Hours:	14	Semester Hours:	15

Summer

Credit Hours

<u>CDA 3201</u> Computer Logic and Design	3
<u>COP 4530</u> Data Structures	3
<u>EGN 4450</u> Introduction to Linear Systems	2
<u>CDA 3201L</u> Computer Logic and Design Lab	1
Semester Hours:	9

Semester 5

Credit Hours

<u>COT 4400</u> Analysis Of Algorithms	3
<u>CDA 4205</u> Computer Architecture	3
<u>EEE 3394</u> Electronic Materials	3
<u>EGN 3373</u> Introduction to Electrical Systems I	3
CSE Hardware Elective	3
Semester Hours:	15

Semester 6

Credit Hours

<u>CDA 4203</u> Computer System Design	3
<u>EGN 3615</u> Engineering Economics with Social and Global Implications	3
<u>CANL</u> FKL/Gen Ed Natural Sciences (Life Science)	3
<u>COP 4600</u> Operating Systems	3
CSE Hardware Elective	3
<u>CDA 4203L</u> Computer System Design Lab	1
Semester Hours:	16

Summer

Credit Hours

Internship/Co-op Participation	
Semester Hours:	0

Semester 7

Credit Hours

<u>CDA 4213</u> CMOS-VLSI Design	3
<u>ENC 3246</u> Communication for Engineers	3
<u>CAFA</u> FKL/Gen Ed Fine Arts	3
<u>EGN 3443</u> Probability and Statistics for Engineers	3
CSE Elective	3
<u>CDA 4213L</u> CMOS-VLSI Design Lab	1
Semester Hours:	16

Semester 8

Credit Hours

<u>CIS 4250</u> Ethical Issues and Professional Conduct	3
<u>CAGC</u> FKL/Gen Ed Human and Cultural Diversity in a Global Context	3
CSE Elective	3
<u>CAHU</u> FKL/Gen Ed Humanities (with HHCP)	3
<u>CIS 4910</u> Computer Science Project	2
Semester Hours:	14

Gordon Rule Requirement

Gordon Rule (6A) 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.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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.

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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.

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.

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

Undergraduate Advising: http://www.cse.usf.edu/undergraduate/people_to_contact/.

COMPUTER ENGINEERING FACULTY

Chairperson: L. Hall; *Distinguished Professors:* L. Hall, N. Ranganathan; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegler, S. Sarkar, A. Weitzenfeld; *Associate Professors:* W. Armitage, P. Bao, S. Chellappan, A. Gaspar, A. Iamnitich, J. Ligatti, S. Katkooi, X. Ou, Y. Tu, H. Zheng; *Assistant Professors:* S. Ghosh, Y. Liu, L. Palmer, P. Rosen, Y. Sun; *Instructors:* W. Gauvin, W. Hendrix, I. Hidalgo, H. Jeanty, X. Li, R. Tindell, J. Wang, Y. Zhang; *Distinguished Professor Emeritus:* A. Kandel; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

• 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 and on the theory of computation. 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.

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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 admission requirements for the major, and are in good academic standing, may declare a major in Computer Science. Prior to being admitted to a department, a student may be permitted to 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
5. *Minimum Continuation Requirements for the Computer Science Program*

Students meeting the above requirements may be admitted to either 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.

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.

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 dual degree 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.

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STATE MANDATED COMMON COURSE PREREQUISITES

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.

Students should complete the following **prerequisite courses** listed below 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 (C- is insufficient).

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.

Some courses required for the major may also meet General Education Requirements thereby transferring maximum hours to the university.

- 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 (69 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 4450 Introduction to Linear Systems
- EGN 3443 Probability and Statistics for Engineers

Specialization (34 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 Design Lab
- CDA 4205 Computer Architecture
- 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 (27 hours)

15 hours of Department Upper-Level Electives (CSE Elective)

6 hours of Department Upper-Level Electives (CSE Software Elective)

- CAP 4034 Computer Animation Fundamentals
- CAP 4063 Web Application Design
- CAP 4401 Image Processing Fundamentals

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CAP 4410	Computer Vision
CAP 4800	Systems Simulation
CAP 5400	Digital Image Processing
CAP 5625	Introduction to Artificial Intelligence
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 4504	Computer Networks II
COP 3257	JAVA for Experienced Programmers
COP 4020	Programming Languages
COP 4365	Software System Development
COP 4620	Compilers
COP 4656	Software Development for Mobile Devices
COP 4710	Database Design

3 hours of Department Upper-Level Elective (CSE Theory Elective)
4000-level COP course

CIS 4930 Special Topics in Computer Science I

3 hours of Upper-Level Humanities, Social Sciences, or Fine Arts Elective

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>ENC 1101</u> Composition I	3	<u>ENC 1102</u> Composition II	3
<u>CANP FKL/Gen Ed Natural Sciences (Physical Science)</u>	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>SGES</u> General Education Core Social Sciences	3	<u>COP 2510</u> Programming Concepts	3
<u>EGN 3000L</u> Foundations of Engineering Lab	1	<u>PHY 2048L</u> General Physics I Laboratory	1
! <u>EGN 3000</u> Foundations of Engineering		Semester Hours:	14
Semester Hours:	14		

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>CDA 3103</u> Computer Organization	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>SGEH</u> General Education Core Humanities	3
<u>COP 3514</u> Program Design	3	<u>COT 3100</u> Introduction to Discrete Structures	3
<u>CASB FKL/Gen Ed Social and Behavioral Sciences</u>	3	<u>COP 3331</u> Object Oriented Software Design	3
<u>PHY 2049L</u> General Physics II Laboratory	1	Semester Hours:	12
Semester Hours:	14		

Summer

	Credit Hours
<u>CDA 3201</u> Computer Logic and Design	3
<u>COP 4530</u> Data Structures	3

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<u>EGN 4450</u> Introduction to Linear Systems	2
<u>CDA 3201L</u> Computer Logic and Design Lab	1
Semester Hours:	9

Semester 5	Credit Hours	Semester 6	Credit Hours
<u>COT 4400</u> Analysis Of Algorithms	3	<u>ENC 3246</u> Communication for Engineers	3
<u>CDA 4205</u> Computer Architecture	3	<u>COP 4600</u> Operating Systems	3
<u>CANL</u> FKL/Gen Ed Natural Sciences (Life Science)	3	CSE Elective	3
<u>EGN 3443</u> Probability and Statistics for Engineers	3	CSE Software Elective	3
CSE Software Elective	3	CSE Theory Elective	3
Semester Hours:	15	Semester Hours:	15

Summer	Credit Hours
Internship/Co-op Participation	
Semester Hours:	0

Semester 7	Credit Hours	Semester 8	Credit Hours
<u>CAFA</u> FKL/Gen Ed Fine Arts	3	<u>CIS 4250</u> Ethical Issues and Professional Conduct	3
<u>CAGC</u> FKL/Gen Ed Human and Cultural Diversity in a Global Context	3	CSE Elective	3
CSE Elective	3	CSE Elective	3
CSE Elective	3	Upper-Level FKL Humanities, Social Science or Fine Arts Elective	3
<u>CAHU</u> FKL/Gen Ed Humanities (with HHCP)	3	Semester Hours:	12
Semester Hours:	15		

Gordon Rule Requirement

Gordon Rule (6A) 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.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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.

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

Advising Information

Undergraduate Advising: http://www.cse.usf.edu/undergraduate/people_to_contact/.

REQUIREMENTS FOR THE MINOR IN COMPUTER SCIENCE (BCS) TOTAL MINOR HOURS: 18

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

The Computer Science minor is expected to be very attractive to students in other Engineering departments and to students in Mathematics and the Sciences (including Physics, Chemistry, and Biology).

This minor is an 18-credit hour program that is open to all students, except for students majoring in Computer Science, Computer Engineering and Information Technology, who meet the prerequisites listed below.

Minor Core (12 hours)

COP 3514	Program Design
CDA 3103	Computer Organization
COP 3331	Object Oriented Design
COP 4530	Data Structures

Minor Electives (6 hours)

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

Students must register with the Department of Computer Science and Engineering 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.

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.

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

COMPUTER SCIENCE FACULTY

Chairperson: L. Hall; *Distinguished Professors:* L. Hall, N. Ranganathan; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegler, S. Sarkar, A. Weitzenfeld; *Associate Professors:* W. Armitage, P. Bao, S. Chellappan, A. Gaspar, A. Iamnitchi, J. Ligatti, S. Katkooi, X. Ou, Y. Tu, H. Zheng; *Assistant Professors:* S. Ghosh, Y.

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Liu, L. Palmer, P. Rosen, Y. Sun; Instructors: W. Gauvin, W. Hendrix, I. Hidalgo, H. Jeanty, X. Li, R. Tindell, J. Wang, Y. Zhang; Distinguished Professor Emeritus: A. Kandel; 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 Electrical Engineering and the electrical sciences: circuit analysis and design, electronics, communications, electromagnetics, controls, solid state, system analysis, and microelectromechanical systems (MEMS), bioelectrical devices and systems, and power engineering. Basic concepts are augmented with well-equipped laboratories in circuits, electronics, digital systems, microwave techniques, wireless circuits & systems, and controls and communications. In addition, a general-purpose computer facility, a microprocessor and digital signal processing laboratory, and a microelectronics fabrication, design/test and metrology laboratory are available.

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)
 - 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 2.75 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 EGN 3373, EGN 3374, and Differential Equations with grades 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.

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 approval of their EE Technical electives.
2. Students must complete Exit interviews as a graduation requirement.

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Course Grade Requirement

Continuation in the major requires successful completion of EGN 3373, EGN 3374, and Differential Equations with grades of B (not B-) or higher (best attempt).

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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

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.

Students should complete the following **prerequisite courses** listed below 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.

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.

Some courses required for the major may also meet General Education Requirements thereby transferring maximum hours to the university.

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

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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 Laboratory
 EGN 3443 Probability and Statistics for Engineers
 EGN 3615 Engineering Economics with Social and Global Implications (required FKL Social and Behavioral Elective)
 EGN 3373 Introduction to Electrical Systems I
 EGN 3420 Engineering Analysis

Specialization (52 credit hours)

EEE 3394 Electronic Materials
 EEL 2161 Electrical Engineering Computer Methods
 EGN 3374 Electrical Systems II
 EEE 4351C Semiconductor Devices
 EEL 3100 Network Analysis
 EEL 3115L Laboratory I
 EEL 4471 Electromagnetics
 EEL 4705 Logic Design
 EEL 4705L Logic Laboratory
 EEE 3302 Electronics I
 EEL 4102 Linear Systems Analysis
 EEL 4423L Wireless Circuits & Systems Design Laboratory
 EEL 4743L Microprocessor Laboratory
 EEL 4744 Microprocessor Principles and Applications
 EGN 3375 Electromechanical Systems
 EEL 3116L Laboratory II
 EEL 4512C Introduction to Communication Systems
 EEL 4657 Linear Control Systems
 EEL 4657L Linear Controls Laboratory
 EEL 4906 EE Design I
 EEL 4914 EE Design II (CPST)

Technical Writing (3 credit hours)

ENC 3246 Communication for Engineers (WRIN)

Major Electives (12 hours)

12 hours of Department Upper-Level Electives

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>CHM 2045</u> or <u>CHS 2440</u>	3	<u>ENC 1102</u> Composition II	3
<u>ENC 1101</u> Composition I	3	<u>EEL 4705</u> Logic Design	3
<u>SGES</u> General Education Core Social Sciences	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>CHM 2045L</u> or <u>CHS 2440L</u>	1	<u>PHY 2048L</u> General Physics I Laboratory	1
<u>EGN 3000L</u> Foundations of Engineering Lab	1	Semester Hours:	14
! <u>EGN 3000</u> Foundations of Engineering			
Semester Hours:	15		

Summer

Summer Opportunities

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Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>SGEH</u> General Education Core Humanities	3
<u>EGN 3615</u> Engineering Economics with Social and Global Implications	3	<u>EEE 3394</u> Electronic Materials	3
<u>EEL 2161</u> Electrical Engineering Computer Methods	3	<u>EGN 3420</u> Engineering Analysis	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>EGN 3373</u> Introduction to Electrical Systems I	3
<u>PHY 2049L</u> General Physics II Laboratory	1	<u>EGN 3433</u> or <u>MAP 2302</u>	3
Semester Hours:	14	<u>EEL 4705L</u> Logic Laboratory	1
		Semester Hours:	16

Summer	Credit Hours
<u>ENC 3246</u> Communication for Engineers	3
<u>EGN 3374</u> Introduction to Electrical Systems II	3
<u>CAHU</u> FKL/Gen Ed Humanities (with HHCP)	3
Semester Hours:	9

Semester 5	Credit Hours	Semester 6	Credit Hours
<u>EEL 4471</u> Electromagnetics	3	<u>EGN 3375</u> Electromechanical Systems	3
<u>CAFA</u> FKL/Gen Ed Fine Arts	3	<u>EEE 3302</u> Electronics I	3
<u>EEL 3100</u> Network Analysis and Design	3	<u>EEL 4102</u> Linear Systems Analysis	3
<u>EEE 4351C</u> Semiconductor Devices	3	<u>EEL 4744</u> Microprocessor Principles and Applications	3
<u>EEL 3115L</u> Laboratory I	1	<u>EEL 4423L</u> Wireless Circuits & Systems Design Laboratory	2
<u>EGN 3443</u> Probability and Statistics for Engineers	3	<u>EEL 4743L</u> Microprocessor Laboratory	1
Semester Hours:	16	Semester Hours:	15

Summer	Credit Hours
Internship/Co-op Participation	0
Semester Hours:	0

Semester 7	Credit Hours	Semester 8	Credit Hours
<u>EEL 4512C</u> Introduction to Communication Systems	3	<u>CAGC</u> FKL/Gen Ed Human and Cultural Diversity in a Global Context	3
<u>EEL 4657</u> Linear Control Systems	3	<u>EEL 4914</u> EE Design 2	3
<u>EEL 4906</u> EE Design 1	3	Upper-Level Department Elective	3
Upper-Level Department Elective	3	Upper-Level Department Elective	3
<u>EEL 3116L</u> Laboratory II	1	Upper-Level Department Elective	3
<u>EEL 4657L</u> Linear Controls Laboratory	1	Semester Hours:	15
Semester Hours:	14		

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Gordon Rule Requirement

Gordon Rule (6A) 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 6A communication course or by completing an AA degree at a Florida College System institution.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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.

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: ENC 1302; Phone: (813) 974-2684; Email: eng-advisingmail@usf.edu

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, ENB 379C, (813) 974-2369

ELECTRICAL ENGINEERING FACULTY

Chairperson: T. Weller; *Professors:* Robert H. Bishop, 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:* H. Arslan, S. Bhanja, J. Wang, P.H. Wiley; *Assistant Professors:* L. Fan, R. Fehr, Z. Miao, G. Mumcu, K. Selcuk, A. Takshi, S.W. Thomas, I. Uysal; *Instructors:* Chung Seop Jeong.

• 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

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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

Department Policies

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.

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.

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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

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.

Students should complete the following **prerequisite courses** listed below 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.

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.

Some courses required for the major may also meet General Education Requirements thereby transferring maximum hours to the University.

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

Courses at a Florida College System Institution

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

Lab

PHY 2048/2048L General Physics I - Calculus Based with Lab
PHY X048/X048L or PHY X048C or PHY X043/X048L

PHY 2049/2049L General Physics II - Calculus Based with Lab
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 2040L 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
EGN 3615 Engineering Economics with Social and Global Implications (required FKL Social and Behavioral Elective)

Specialization (48 credit hours)

ESI 2009 Introduction to Engineering Programming
EIN 4312C Work Analysis
EIN 4621 Manufacturing Processes
ESI 4312 Deterministic O.R.
EIN 4333 Production Control
ESI 4221 Industrial Statistics and 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

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- 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

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>CHM 2045</u> or <u>CHS 2440</u>	3	<u>ENC 1102</u> Composition II	3
<u>ENC 1101</u> Composition I	3	<u>SGEH</u> General Education Core Humanities	3
<u>SGES</u> General Education Core Social Sciences	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>CHM 2045L</u> or <u>CHS 2440L</u>	1	<u>CAFA</u> FKL/Gen Ed Fine Arts	3
<u>EGN 3000L</u> Foundations of Engineering Lab	1	<u>PHY 2048L</u> General Physics I Laboratory	1
! <u>EGN 3000</u> Foundations of Engineering		Semester Hours:	17
Semester Hours:	15		

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>EGN 1113</u> Introduction to Design Graphics	3
<u>CAHU</u> FKL/Gen Ed Humanities (with HHCP)	3	<u>EGN 3373</u> Introduction to Electrical Systems I	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>EGN 3433</u> or <u>MAP 2302</u>	3
<u>EGN 3443</u> Probability and Statistics for Engineers	3	<u>EGN 3365</u> Materials Engineering I	3
<u>EGN 4450</u> Introduction to Linear Systems	2	<u>EGN 3311</u> Statics	3
<u>PHY 2049L</u> General Physics II Laboratory	1	Semester Hours:	15

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Semester Hours: 16

Summer		Credit Hours
<u>EGN 3615</u> Engineering Economics with Social and Global Implications		3
<u>CAGC FKL/Gen Ed</u> Human and Cultural Diversity in a Global Context		3
<u>EGN 3343</u> Thermodynamics I		3
Semester Hours:		9

Semester 5	Credit Hours	Semester 6	Credit Hours
<u>ENC 3246</u> Communication for Engineers	3	<u>ESI 4620</u> Design of Industrial Information Systems	3
<u>ESI 4312</u> Deterministic O.R.	3	<u>ESI 4313</u> Probabilistic O.R.	3
<u>ESI 2009</u> Introduction to Engineering Programming	3	<u>EIN 4333</u> Production Control	3
<u>EIN 4621</u> Manufacturing Processes	3	<u>ESI 4221</u> Statistical Quality Control	3
<u>EIN 4312C</u> Work Analysis	3	Upper-Level Department Elective	3
Semester Hours:	15	Semester Hours:	15

Summer	Credit Hours
Internship/Co-op Participation	
Semester Hours:	0

Semester 7	Credit Hours	Semester 8	Credit Hours
<u>ESI 4244</u> Design of Experiments	3	<u>EIN 4601C</u> Automation and Robotics	3
<u>ESI 4606</u> Engineering Analytics I	3	<u>EIN 4891</u> Capstone Design	3
<u>EIN 4364</u> Facilities Design and Cost Analysis	3	<u>ESI 4607</u> Engineering Analytics II	3
<u>ESI 4523</u> Systems Simulation	3	<u>EIN 4243C</u> Human Factors	3
Upper-Level Department Elective	2	Semester Hours:	12
Semester Hours:	14		

Gordon Rule Requirement

Gordon Rule (6A) 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

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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)

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.

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.

Accreditation Information

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

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 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.

INDUSTRIAL ENGINEERING FACULTY

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

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

<http://www.cse.usf.edu/undergraduate/>

The Information Technology program fills the gap between Computer Science and Management Information Systems. This program focuses on identifying suitable technologies and applying fundamental computing knowledge to solve business problems. Students in this program can acquire a specialization in key Information Technology topics or get familiar with a broad range of computing technologies. Currently all IT courses are online, however, this might change in the future. The Information Technology major is currently fully 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 basic principles and practices of information technology to identify sustainable technologies and apply fundamental computing knowledge to solve business problems.

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Entrance Requirements for the Information Technology Program

Students admitted to the University of South Florida and the College of Engineering must qualify for the major by successfully meeting the requirements below. Students who have fully met the admission requirements for the major, and are in good academic standing, may declare Information Technology. Early admission may be possible for students with strong academic performance.

A minimum grade of C in each course is required (grade of C- is insufficient).

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.

Grading Requirement

Only grades of C or better in IT courses can be used to fulfill graduation requirements; a grade of C- is insufficient.

1. Completion of:
 - 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
2. A minimum overall GPA of 2.0
3. A minimum USF GPA of 2.0

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 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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

Transfer Credit

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.

Students should complete the following prerequisite courses listed below at the lower level prior to entering the university. If these courses are not taken at the community college, they must be completed before the degree is granted. Unless otherwise stated, a grade of C is the minimum acceptable grade.

- 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

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- XXXX XXXX Any Discrete Math course
- COP XXXX Any Object-Oriented Computer Programming course

REQUIREMENTS FOR THE MAJOR IN INFORMATION TECHNOLOGY TOTAL MAJOR HOURS: 86

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

Major Core (71 hours)

PSY	2012	Introduction to Psychological Science
STA	2023	Introductory Statistics I
ECO	2013	Economics Principles (Macroeconomics)
MAC	1147	Precalculus Algebra and Trigonometry
PHY	2020	Conceptual Physics
MAD	2104	Discrete Math
CGS	1540	Introduction to Databases for Information Technology
COP	XXXX	Programming Concepts for Information Technology
CGS	3303	Information Technology Concepts
COP	XXXX	Object Oriented Programming for Information Technology
COP	3515	Program Design for Information Technology
CEN	3722	Human Computer Interfaces for Information Technology
CDA	3101	Computer Organization for Information Technology
INR	3033	International Political Cultures
CNT	4104	Computer Information Networks for Information Technology
CNT	4104L	Information Networks Laboratory for Information Technology
EEL 4	854	Data Structures and Algorithms for Information Technology
COP	4703	Database Systems for Information Technology
CEN	4031	Software Engineering Concepts for Information Technology
COP	4610	Operating Systems for Information Technology
COP	4930	Information Technology Seminar*
CIS	4935	Senior Project in Information Technology
CIS	4253	Ethics for Information Technology
ETG	4931	Special Topics in Technology (Advanced Written and Oral Communication for IT)
ENC	3246	Communication for Engineers (WRIN)

*COP 4930 Information Technology Seminar includes attendance at department-sponsored colloquia as well as attendance at student presentations of their senior projects. Colloquia and senior project attendance at any time during your program can be accumulated and used to satisfy the requirements of COP 4930 when you actually register for that course.

Major Electives (15 hours)

15 hours of IT Approved Electives from the following list:

CGS	3845	Electronic Commerce
CGS	3853	IT Web Design
CIS	3360	Principles of Information Security
CIS	3362	Cryptography and Information Security
CIS	3367	Architecting Operating System Security
CIS	4204	Ethical Hacking
CIS	4361	Information Technology Security Management
CIS	4412	Information Technology Information Management
CIS	4932	Special Topics for Information Technology
COP	4814	Web Services
COP	4816	XML Applications
COP	4834	Data-Driven Web Sites
CNT	3403	Network Security and Firewalls
CTS	4348	Linux Administration
ISM	3011	Information Systems in Organizations
LIS	3361	World Wide Web Page Design and Management
MAN	3025	Principles of Management

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Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>EGN 3000</u> Foundations of Engineering		<u>MAC 1147</u> Precalculus Algebra and Trigonometry	4
<u>ENC 1101</u> Composition I	3	<u>ENC 1102</u> Composition II	3
<u>CAGC</u> FKL/Gen Ed Human and Cultural Diversity in a Global Context	3	<u>PSY 2012</u> Introduction to Psychological Science	3
<u>CGS 1540</u> Introduction to Databases for Information Technology	3	<u>COP 2930</u> or (Programming Concepts for Information Technology)	3
General Elective	3	General Elective	3
Semester Hours:	12	Semester Hours:	16

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>ECO 2013</u> Economic Principles (Macroeconomics)	3	<u>PHY 2020</u> Conceptual Physics	3
<u>CANL</u> FKL/Gen Ed Natural Sciences (Life Science)	3	<u>MAD 2104</u> Discrete Mathematics	3
<u>STA 2023</u> Introductory Statistics I	3	<u>CAFA</u> FKL/Gen Ed Fine Arts	3
<u>COP 2931</u> or (Object-Oriented Programming for IT)	3	<u>SGEH</u> General Education Core Humanities	3
<u>EGN 3000L</u> Foundations of Engineering Lab	1	Semester Hours:	12
Semester Hours:	13		

Summer

	Credit Hours
<u>CGS 3303</u> IT Concepts	3
<u>CAHU</u> FKL/Gen Ed Humanities (with HHCP)	3
IT Approved Elective	3
Semester Hours:	9

Semester 5	Credit Hours	Semester 6	Credit Hours
<u>ENC 3246</u> Communication for Engineers	3	<u>ETG 4931</u> Special Topics in Technology I	3
<u>CEN 3722</u> Human Computer Interfaces for Information Technology	3	<u>CNT 4104</u> Computer Information Networks for Information Technology	3
<u>INR 3033</u> International Political Cultures	3	<u>CDA 3101</u> Computer Organization for Information Technology	3
<u>COP 3515</u> Program Design for Information Technology	3	<u>EEL 4854</u> Data Structures and Algorithms for Information Technology	3
Semester Hours:	12	IT Approved Elective	3
		<u>CNT 4104L</u> Computer Information Networks Laboratory for IT	1
		Semester Hours:	16

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Summer		Credit Hours	
Internship/Co-op Participation		Semester Hours:	0
Semester 7	Credit Hours	Semester 8	Credit Hours
<u>COP 4703</u> Database Systems for Information Technology	3	<u>COP 4930</u> Information Technology Seminar	1
<u>COP 4610</u> Operating Systems for Information Technology	3	<u>CIS 4253</u> Ethics for Information Technology	3
<u>CEN 4031</u> Software Engineering Concepts for Information Technology	3	<u>CIS 4935</u> Senior Project in Information Technology	5
IT Approved Elective	3	IT Approved Elective	3
IT Approved Elective	3	IT Approved Elective	3
Semester Hours:	15	Semester Hours:	15

Gordon Rule Requirement

Gordon Rule (6A) 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.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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)
CIS 4935 Senior Project in Information Technology (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.

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.

Advising Information

Undergraduate Advising: http://www.cse.usf.edu/undergraduate/people_to_contact/.

REQUIREMENTS FOR THE MINOR IN IT GENERAL MINOR (ITG)

TOTAL MINOR HOURS: 15

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

The IT General minor is a 15-credit hour program aimed at providing an basic understanding of the significant concepts underlying Information Technology while enabling the student to specialize by choosing four elective topics. Available electives encompass a wide spectrum of topics such as programming, networking, web design, human-computer interface and security management. This minor is open to all students, except for Information Technology, Computer Science or Computer Engineering majors, who meet the prerequisites listed.

Minor Core (3 hours)

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CGS 3303	IT Concepts (a prerequisite, any Physics course, is required for this course)
Minor Electives (12 hours)	
CDA 3101	Computer Organization for Information Technology (prerequisites required for this course)
CEN 3722	Human Computer Interfaces for Information Technology
CIS 4361	Information Technology Security Management
CIS 4412	Information Technology Resource Management
COP 3515	Program Design for Information Technology (prerequisites required for this course)
EEL 4782	Computer Information Networks for Information Technology
EEL 4782L	Information Networks Laboratory for Information Technology
EEL 4854	Data Structures and Algorithms for IT (prerequisites required for this course)
CIS 39XX	Special Topics in Information Technology
CIS 49XX	Special Topics in Information Technology
COP 39XX	Special Topics in Information Technology
COP 49XX	Special Topics in Information Technology
ETG 39XX	Special Topics in Information Technology
ETG 49XX	Special Topics in Information Technology

Students must register with the IT Program undergraduate advisor prior to starting this minor program. Consultation with the 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 an IT program major.

Prerequisite for Required Course (3 credit hours):

PHY XXXX Any Physics course

GPA Requirement

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

REQUIREMENTS FOR THE MINOR IN IT TECHNICAL MINOR (ITE)

TOTAL MINOR HOURS: 24

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

The IT Technical minor is a 24-credit hour program that provides a small core of three essential technical courses meant to provide students with the conceptual and technical basis necessary to deal with more advanced topics. Rounding out the IT Technical minor are five electives to be chosen from a larger set of courses. Students are expected to develop a conceptual understanding of the IT field while developing programming skills they may apply to strengthen their major. It is open to all students, except for Information Technology, Computer Science or Computer Engineering majors, who meet the prerequisites listed.

Minor Core (9 hours)

Required Courses:

CGS 3303	IT Concepts (a prerequisite is required for this course)
COP 3515	Program Design for Information Technology (a prerequisite is required for this course)
EEL 4854	Data Structures and Algorithms for IT (prerequisites required for this course)

Minor Electives (15 hours)

Electives (choose five course from the list below):

CDA 3101	Computer Organization for Information Technology (prerequisites required for this course)
CEN 3722	Human Computer Interfaces for Information Technology
CEN 4031	Software Engineering Concepts for IT (prerequisites required for this course)
CIS 4361	Information Technology Security Management
CIS 4412	Information Technology Resource Management
COP 4610	Operating Systems for Information Technology (prerequisites required for this course)
COP 4610L	Operating Systems Laboratory for IT (prerequisites required for this course)
COP 4703	Database Systems for Information Technology (prerequisites required for this course)
EEL 4782	Computer Information Networks for Information Technology
EEL 4782L	Information Networks Laboratory for Information Technology
CIS 39XX	Special Topics in Information Technology
CIS 49XX	Special Topics in Information Technology
COP 39XX	Special Topics in Information Technology
COP 49XX	Special Topics in Information Technology
ETG 39XX	Special Topics in Information Technology
ETG 49XX	Special Topics in Information Technology

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Students must register with the IT Program undergraduate advisor prior to starting this minor program. Consultation with the 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 an IT program major.

Prerequisites for Required Courses (9 credit hours):

COP 2930	Special Topics for Information Technology - IT Programming Concepts
MAD 2104	Discrete Math or ETG 3934 Special Topics for Information Technology -Discrete Math for IT
PHY XXXX	Any Physics course

GPA Requirement

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

INFORMATION TECHNOLOGY FACULTY

Chairperson: L. Hall; *Distinguished Professors:* L. Hall, N. Ranganathan; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegler, S. Sarkar, A. Weitzenfeld; *Associate Professors:* W. Armitage, P. Bao, S. Chellappan, A. Gaspar, A. Iamnitchi, J. Ligatti, S. Katkooi, X. Ou, Y. Tu, H. Zheng; *Assistant Professors:* S. Ghosh, Y. Liu, L. Palmer, P. Rosen, Y. Sun; *Instructors:* W. Gauvin, W. Hendrix, I. Hidalgo, H. Jeanty, X. Li, R. Tindell, J. Wang, Y. Zhang; *Distinguished Professor Emeritus:* A. Kandel; *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, 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.

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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.

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 dual degree 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 MANDATED COMMON COURSE PREREQUISITES

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. Students should complete the prerequisite courses listed below 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 admission into the department is granted. 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.

A grade of C is the minimum acceptable grade in these prerequisite courses.

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

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.

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 2440/2440L General Chemistry for Engineers
with lab

Courses at a Florida College System Institution

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

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PHY 2048/2048L General Physics I - Calculus Based with Lab	PHY X048/X048L or PHY X048C or PHY X043/X048L
PHY 2049/2049L General Physics II - Calculus Based with Lab	PHY X049/X049L or PHY X049C or PHY X044/X049L

REQUIREMENTS FOR THE MAJOR IN MECHANICAL ENGINEERING

TOTAL MAJOR HOURS: 104

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

Major Core (92 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
CHS 2440L	General Chemistry for Engineers 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 (19 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
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)
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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

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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

Eight Semester Plan

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full-time students. Note: Items that are critical are marked with a "!" and are included in the plan for a student to stay on track.

Semester 1	Credit Hours	Semester 2	Credit Hours
<u>MAC 2281</u> or <u>MAC 2311</u>	4	<u>MAC 2282</u> or <u>MAC 2312</u>	4
<u>CHM 2045</u> or <u>CHS 2440</u>	3	<u>ENC 1102</u> Composition II	3
<u>ENC 1101</u> Composition I	3	<u>CAFA</u> FKL/Gen Ed Fine Arts	3
<u>SGEH</u> General Education Core Humanities	3	<u>PHY 2048</u> General Physics I - Calculus Based	3
<u>CHM 2045L</u> or <u>CHS 2440L</u>	1	<u>PHY 2048L</u> General Physics I Laboratory	1
<u>EGN 3000L</u> Foundations of Engineering Lab	1	Semester Hours:	14
! <u>EGN 3000</u> Foundations of Engineering			
Semester Hours:	15		

Summer

Summer Opportunities

Semester 3	Credit Hours	Semester 4	Credit Hours
<u>MAC 2283</u> or <u>MAC 2313</u>	4	<u>MAP 2302</u> Differential Equations	3
<u>EGN 3615</u> Engineering Economics with Social and Global Implications	3	<u>EGN 3321</u> Dynamics	3
<u>PHY 2049</u> General Physics II - Calculus Based	3	<u>EML 3500</u> Mechanics of Solids	3
<u>EGN 3311</u> Statics	3	<u>EGN 3343</u> Thermodynamics I	3
<u>PHY 2049L</u> General Physics II Laboratory	1	<u>SGES</u> General Education Core Social Sciences	3
Semester Hours:	14	Semester Hours:	15

Summer

	Credit Hours
<u>EGN 3365</u> Materials Engineering I	3
<u>EML 3035</u> Programming Concepts for Mechanical Engineers	1
<u>EGN 3443</u> Probability and Statistics for Engineers	3
<u>EML 3022</u> Computer Aided Design and Engineering	3
Semester Hours:	10

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Semester 5	Credit Hours	Semester 6	Credit Hours
<u>ENC 3246</u> Communication for Engineers	3	<u>CAGC FKL/Gen Ed</u> Human and Cultural Diversity in a Global Context	3
<u>EML 3041</u> Computational Methods	3	<u>EGN 3373</u> Introduction to Electrical Systems I	3
<u>EML 3262</u> Kinematics and Dynamics of Machinery	3	<u>EML 4501</u> Machine Design	3
<u>EML 3701</u> Fluid Systems	3	<u>EML 3303</u> Mechanical Engineering Lab I	3
<u>EML 4325</u> Mechanical Manufacturing Processes	3	<u>EML 4106C</u> Thermal Systems and Economics	3
Semester Hours:	15	Semester Hours:	15

Summer	Credit Hours
Internship/Co-op Participation	
Semester Hours:	0

Semester 7	Credit Hours	Semester 8	Credit Hours
<u>EML 4302</u> Mechanical Engineering Laboratory II	3	<u>EML 4551</u> Capstone Design	3
<u>EML 4123</u> Heat Transfer	3	<u>EML 4312</u> Mechanical Controls Major Upper-Level Department Elective	3
<u>EML 4220</u> Vibrations	3	Major Upper-Level Department Elective	3
Major Upper-Level Department Elective	3	<u>CAHU FKL/Gen Ed</u> Humanities (with HHCP)	3
Major Upper-Level Department Elective	3		
Semester Hours:	15	Semester Hours:	15

Gordon Rule Requirement

Gordon Rule (6A) 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 an approved 6A communication course or by completing an AA degree at a Florida College System institution.

General Education and Foundations of Knowledge and Learning (FKL) Requirements

The math and science courses required for this major fully meet the math and science requirements of the General Education Core and 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.

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.

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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://me.eng.usf.edu/students/undergraduates.htm>.

Dr. Dan Hess, Professor & Undergraduate Advisor, (813) 974-2280, ENC 2205.

MECHANICAL ENGINEERING FACULTY

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

REQUIREMENTS FOR THE MINOR IN BIOMEDICAL ENGINEERING (EBI)

TOTAL MINOR HOURS: 15

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

The Biomedical Engineering minor is a 15-credit hour program 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.

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:

- ECH 4931 Special Topics in Chemical Engineering*
- PHZ 4702 Applications of Physics to Biology & Medicine I
- PHZ 4703 Applications of Physics to Biology & Medicine II
- BCH 3023 Introductory Biochemistry
- EIN 4243C Human Factors
- BME 5320 Theory and Design of Bioprocesses
- BME 5040 Pharmaceutical Engineering
- BME 4332 Cell and Tissue Engineering
- BME 4440 Introduction to Bioastronautics
- ECH 5748 Selected Topics in Biomedical Engineering**
- BME 5748 Selected Topics in Biomedical Engineering**

*The list of approved special topics courses is below.

- ECH 4931 Bioseparations
- ECH 4931 Chemical/Bio Sensors & Microfabrication
- ECH 4931 Nanomedicine
- ECH 4931 Modern Biomedical Technologies
- ECH 4931 Engineering Physiology
- ECH 4931 Research Design Methods & Interpretations
- ECH 4931 Biomedical Image Processing
- ECH 4931 or EEL 4936 Bioelectricity

**Please see academic advisor for selected topics courses.

Prerequisite courses:

- Biology I: BSC 2010
- Calculus II: MAC 2282, MAC 2242, or MAC 2312
- Physics II: PHY 2049 or PHY 2054
- 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.