

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Mission Statement

The mission of the USF College of Engineering (COE) is to improve the quality of life in our community by:

- Providing a high-quality education for USF's Engineering and technology 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 College's support and emphasis of these values, COE 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 Systems (B.S.I.S.) (This program has been suspended and is not accepting new admission.)

Information Systems (EIF)

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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, and Mechanical Engineering. In addition, the College offers minors in Biomedical Engineering, Computer Science, and Information Technology. The engineering programs of the College have been developed with an emphasis on three broad aspects of engineering activity: design, research, and the operation of complex technological systems. The undergraduate degree programs provide a strong, broad-based, fundamental engineering education as preparation for careers in industry and government, or as preparation for advanced studies in professional schools of engineering, science, law, business, and medicine.

At the graduate level, students work in close collaboration with faculty, pursuing advanced topics within their disciplines which will result in advancements in their fields and society at large. Students who are interested in advanced design or research should pursue a traditional or accelerated (5-Year) program leading to a Master of Science degree in the designated discipline. The supervision of the academic programs is the function of the administrative departments together with several coordinators. Each department is responsible for specific professional programs, faculty, laboratories, and student advising.

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.

Minimum Performance and Graduation Requirements

Minimum Requirements

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

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

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

Students who do not meet the required minimum GPA in each category are ineligible for further registration in the College unless individually designed academic plans to correct their GPA deficiencies are recommended by their academic advisor. Approved plans must include a strategy to eliminate the deficiency in two semesters or less by meeting specific goals. Students who are afforded this opportunity will be closely monitored. Those who, for any reason, fail to meet the terms of their academic plans will be ineligible to declare or continue to declare a major, or intended major, in the College of Engineering and will be ineligible to register for courses that are restricted to College of

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 three 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.

Undergraduate Admission

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. 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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 Advising Information

Student Advising

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

Advising Center

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

Grade Requirement - 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.

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.

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.

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.

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.)

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Student Academic Grievance Procedure

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

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.

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.

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.

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.

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

• CHEMICAL ENGINEERING (ECH) (CIP = 14.0701) TOTAL DEGREE HOURS: 131

<http://chbme.eng.usf.edu/>

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

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

Mission Statement

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

Program Educational Objectives

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

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

Please visit <http://chbme.eng.usf.edu/about/missionAndObjectives.htm> for additional information.

Required Prerequisites for Entering the Chemical Engineering Program

Students who have met the College of Engineering's admission requirements for engineering majors are assigned a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Students who have fully met the below admission requirements and are in good academic standing, may declare a major in Chemical Engineering. 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.

Bachelor of Science in Chemical Engineering

1. Completion of:
 - (MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282) and (MAC 2313 or MAC 2283)
 - PHY 2048 and PHY 2048L
 - PHY 2049 and PHY 2049L
 - 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.

Grading Requirement

Many courses required for the BS degree in Chemical Engineering have other prerequisite courses. Prerequisite courses must be completed with a C- or better before the student is allowed to take the course. This applies to

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

prerequisite courses taken in other departments as well. The only exceptions are the Admissions Requirements courses listed below, which must be passed with a grade of C or better.

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 thesis 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
PHY X049/X049L or PHY X049C

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

Major requirements for the B.S.C.H. Degree (98 hours)

Math and Science (41 credit hours)

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering 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
CHM 2211 Organic Chemistry II
CHM 2211L Organic Chemistry II Laboratory

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Basic Engineering (7 credit hours)

- EGN 3000 Foundations of Engineering
- EGN 3000L Foundations of Engineering
- EGN 3443 Probability & Statistics for Engineers
- EGN 3343 Thermodynamics I

Specialization (47 credit hours)

- ECH 3023C Material and Energy Balances
- ECH 4123 Chemical Engineering Thermodynamics
- ECH 4264 Transport Phenomena
- ECH 4846 Numerical Methods in Chemical Engineering
- ECH 3702 Instrument Systems I
- ECH 4265C Mass Transfer Operations
- BME 4406 Engineering of Biological Systems
- ECH 3240L Chemical Engineering Lab I
- ECH 4415C Reaction Engineering
- 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)

Electives (9 hours)

9 hours of Departmental Upper-Level Electives.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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.

Foundations of Knowledge and Learning (FKL) Requirement

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

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

Foundations of Knowledge and Learning (FKL) Exit Requirement

The writing intensive and capstone design exit requirements are fully met through ENC3246 and ECH4615.

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
MAC 2281 or MAC 2311	4	MAC 2282 or MAC 2312	4
ENC 1101 Composition I	3	ENC 1102 Composition II	3
CAGC FKL/Gen Ed Human and Cultural Diversity in a Global Context	3	CHM 2046 General Chemistry II	3
CHM 2045 General Chemistry I	3	PHY 2048 General Physics I - Calculus Based (CANP)	3

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

EGN 3000L Foundations of Engineering Lab	1	CHM 2046L General Chemistry II Laboratory	1
CHM 2045L General Chemistry I Laboratory	1	PHY 2048L General Physics I Laboratory	1
EGN 3000 Foundations of Engineering		Semester Hours:	15
	Semester Hours:		15

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
MAC 2283 or MAC 2313	4	ECH 3023C Material and Energy Balances	4
CAHU FKL/Gen Ed Humanities	3	CAFA FKL/Gen Ed Fine Arts	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3	EGN 3433 or MAP 2302	3
PHY 2049 General Physics II - Calculus Based	3	EGN 3343 Thermodynamics I	3
EGN 3443 Probability and Statistics for Engineers	3	CAHU FKL/Gen Ed Humanities	3
PHY 2049L General Physics II Laboratory	1	Semester Hours:	16
Semester Hours:	17		

Summer

	Credit Hours
ENC 3246 Communication for Engineers (WRIN)	3
CHM 2210 Organic Chemistry I	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3
CHM 2210L Organic Chemistry Laboratory I	2
Semester Hours:	11

Semester 5	Credit Hours	Semester 6	Credit Hours
ECH 4846 Numerical Methods in Chemical Engineering	4	ECH 4265C Mass Transfer Operations	4
ECH 4264 Transport Phenomena	4	BME 4406 Engineering of Biological Systems	3
ECH 4123 Chemical Engineering Thermodynamics	3	ECH 3702 Instrument Systems I	3
Upper-Level Department Elective	3	CHM 2211 Organic Chemistry II	3
Semester Hours:	14	CHM 2211L Organic Chemistry Laboratory II	2
		Semester Hours:	15

Summer

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

Semester 7	Credit Hours	Semester 8	Credit Hours
ECH 4415C Reaction Engineering	4	ECH 4241L Chemical Engineering	3

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

ECH 3240L Chemical Engineering Laboratory I	3	Laboratory II	
EMA 4003 Introduction to Materials Science	3	ECH 4323C Process Dynamics and Control	3
ECH 4605 Product and Process Systems Engineering	3	ECH 4615 Product and Process Design (CPST)	3
Upper-Level Department Elective	3	Upper-Level Department Elective	3
Semester Hours:	16	Semester Hours:	12

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.

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>.

CHEMICAL ENGINEERING FACULTY

Chair: 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. Koria, A. Pyayt; *Interdisciplinary Professors:* D. Edins, A. Sagues, J.P. Walton; *Courtesy Faculty:* J. Lloyd, D. McMillan, M. Peterson.

• CIVIL ENGINEERING (ECE) (CIP = 14.0801) TOTAL DEGREE HOURS: 131

<http://www2.eng.usf.edu/cee/>

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 visit <http://www.eng.usf.edu/cee/USFCEE/missionStatement.htm> for additional information.

Required Prerequisites for Entering the Civil Engineering Program

Students who have met the College of Engineering's admission requirements for engineering majors are assigned a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Students who have fully met the below admission requirements and are in good academic standing, may declare a major in Civil Engineering. 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.

Bachelor of Science in Civil Engineering

1. Completion of:
 - o(MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282) and (MAC 2313 or MAC 2283)
 - oPHY 2048 and PHY 2048L
 - oPHY 2049 and PHY 2049L
 - o(CHM 2045 and CHM 2045L) or (CHS 2440 and 2440L)

with a minimum grade of a C in each course and a 2.8 GPA (based on best attempt) in these prerequisites

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

Tracks

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

Departmental Policies

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

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

Course Grade Requirement

Continuation in the Civil & Environmental Engineering major 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

Grading Requirement

Earn a C- or better in all engineering courses used to meet graduation requirements.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 the department if they have completed thesis 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.

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/CHM 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
PHY X049/X049L or PHY X049C

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: 104

Major requirements for the B.S.C.E. Degree (89 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 (Note: EGN 3433 is not a 6A course)
CHS 2440 Chemistry for Engineers
CHS 2440L 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 (26 credit hours)

EGN 3000 Foundations of Engineering
EGN 3000L Foundations of Engineering lab
GLY 3850 Geology for Engineers

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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
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

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 Structures/Materials/Geotechnical 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

Technical Writing (3 credit hours)

ENC	3246	Communications for Engineers (WRIN)
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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
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	4005	Transportation Engineering II

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

TTE 4003 Transportation and Society

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

Students entering the Civil & Environmental Engineering department must have completed the equivalent USF's Engineering Calculus sequence, one year equivalent, USF's General Physics and one semester equivalent USF's General Chemistry with a minimum of 2.8 GPA; and must have an overall and USF GPA of 2.0 or better.

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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.

Foundations of Knowledge and Learning (FKL) Requirement

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

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

Foundations of Knowledge and Learning (FKL) Exit Requirement

The writing intensive and capstone design exit requirements are fully met through ENC 3246 (WRIN) and CES 4750 (CPST) or CEG 4850 (CPST) or CWR 4812 (CPST).

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
MAC 2281 or MAC 2311	4	MAC 2282 or MAC 2312	4
CHM 2045 or CHS 2440	3	ENC 1102 Composition II	3
ENC 1101 Composition I	3	PHY 2048 General Physics I - Calculus Based (CANP)	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3	GLY 3850 Geology For Engineers	3
CHM 2045L or CHS 2440L	1	EGN 1113 Introduction to Design Graphics	3
EGN 3000L Foundations of Engineering Lab	1	PHY 2048L General Physics I Laboratory	1
! EGN 3000 Foundations of Engineering		PHZ 2102 Highly Encouraged	
Semester Hours:	15	Semester Hours:	17

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
MAC 2283 or MAC 2313	4	EGN 3353 Basic Fluid Mechanics	3
PHY 2049 General Physics II -	3	EGN 3321 Dynamics	3

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Calculus Based		CAHU FKL/Gen Ed Humanities	3
EGN 4453 Numerical & Computer Tools I in Civil & Env Eng	3	EGN 3331 Mechanics of Materials	3
EGN 3311 Statics	3	EGN 3331L Mechanics of Materials Laboratory	1
PHY 2049L General Physics II Laboratory	1	EGN 3433 or MAP 2302	3
EGN 3365 Materials Engineering I	3	Semester Hours:	16
Semester Hours:	17		

Summer

Credit Hours

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

Semester 5

Credit Hours

ENV 4001 Environmental Systems Engineering	3
EGN 4454 Numerical & Computer Tools II in Civil & Env Eng	3
EGN 3443 Probability and Statistics for Engineers	3
EGN 3343 Thermodynamics I	3
TTE 4004 Transportation Engineering I	3
Semester Hours:	15

Semester 6

Credit Hours

CWR 4202 Hydraulics	3
EGN 3373 Introduction to Electrical Systems I	3
CES 3102 Structures I	3
CAHU FKL/Gen Ed Humanities	3
CE Concentration Elective	3
ENV 4004L Environmental/Hydraulics Engineering Lab	1
Semester Hours:	16

Summer

Credit Hours

Internship/Co-op Participation	Semester Hours:	0
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Semester 7

Credit Hours

CAFA FKL/Gen Ed Fine Arts	3
CEG 4011 Geotechnical Engineering I	3
CE Concentration Elective	3
CE Concentration Elective	3
CEG 4011L Geotechnical/Transportation Laboratory	1
Semester Hours:	13

Semester 8

Credit Hours

CEG 4850 or CES 4750 or CWR 4812	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3
CE Concentration Elective	3
CE Concentration Elective	3
CGN 4122 Professional and Ethical Issues in Engineering	1
Semester Hours:	13

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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>.

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. Lu, 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; *Assistant Professors:* Q. Lu, Q. Zhang, Y. Zhang; *Instructor:* K. Nohra; M. Stokes; *Courtesy Faculty:* S.E. Polzin, A. Stuart.

• COMPUTER ENGINEERING (ECP) (CIP = 14.0901 (TRACK 1 OF 2)) TOTAL DEGREE HOURS: 128

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

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.

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.

Required Prerequisites for Entering the Computer Engineering Program

Students who have met the College of Engineering's admission requirements for engineering majors are assigned a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Students who have fully met the below admission requirements and are in good academic standing, may declare a major in Computer Engineering.

Bachelor of Science in Computer Engineering and Bachelor of Science in Computer Science

1. Completion of:
 - o ENC 1101 and ENC 1102
 - o (MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282)
 - o PHY 2048 and PHY 2048L
 - o 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 (<http://www.cse.usf.edu>) 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. Continuation in the major requires successful completion of CDA 3103 and COP 3514 with the required grade as stated in the Computer Science and Engineering prerequisite statement in the College of Engineering general section.

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

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.

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 as a graduation requirement.
3. In addition to the College's graduation requirements, the Department policy concerning grades is:
 - o The minimum grade in specialization courses is a "C-", except as stated in Department admission requirements.
 - o The minimum grade in math, science, and engineering courses which are required for the degree is a "C", except as stated in Department admission requirements.

Course Grade Requirement

Continuation in the major requires successful completion of CDA 3103 and COP 3514 with the required GPA as stated in the Computer Science and Engineering prerequisite statement in the College of Engineering general section.

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 thesis 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

Courses at a Florida College System Institution

MAC X311 or MAC X281

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

MAC 2282 Engineering Calculus II	MAC X312 or MAC X282
MAC 2283 Engineering Calculus III	MAC X313 or MAC X283
MAP 2302 Differential Equations	MAP X302

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L General Chemistry I with Lab
CHS 2440/2440L General Chemistry for Engineers
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: 120

Major requirements for the B.S.C.P. Degree (108 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
CHM 2045 General Chemistry I
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 (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 (57 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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 (WI)

Electives (12 hours)

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

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

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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.

Foundations of Knowledge and Learning (FKL) Requirement

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

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

Foundations of Knowledge and Learning (FKL) Exit Requirement

The writing intensive and capstone design exit requirements are fully met through ENC 3246 and CIS 4250.

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
MAC 2281 or MAC 2311	4	MAC 2282 or MAC 2312	4
CHM 2045 or CHS 2440	3	ENC 1102 Composition II	3
ENC 1101 Composition I	3	PHY 2048 General Physics I - Calculus Based	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3	COP 2510 Programming Concepts	3
CHM 2045L or CHS 2440L	1	PHY 2048L General Physics I Laboratory	1
EGN 3000L Foundations of Engineering Lab	1	Semester Hours:	14
! EGN 3000 Foundations of Engineering			
Semester Hours:	15		

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
MAC 2283 or MAC 2313	4	CDA 3103 Computer Organization	3
PHY 2049 General Physics II - Calculus Based	3	CAHU FKL/Gen Ed Humanities	3

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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

Summer

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

Semester 6

Semester 5	Credit Hours	Semester 6	Credit Hours
COT 4400 Analysis Of Algorithms	3	CDA 4203 Computer System Design	3
CDA 4205 Computer Architecture	3	EGN 3615 Engineering Economics with Social and Global Implications	3
EEE 3394 Electronic Materials	3	Natural Science Elective (Life or Physical)	3
EGN 3373 Introduction to Electrical Systems I	3	COP 4600 Operating Systems	3
CSE Hardware Elective	3	CSE Hardware Elective	3
Semester Hours:	15	CDA 4203L Computer System Design Lab	1
		Semester Hours:	16

Summer

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

Semester 7

Semester 7	Credit Hours	Semester 8	Credit Hours
CDA 4213 CMOS-VLSI Design	3	CIS 4250 Ethical Issues And Professional Conduct (CPST)	3
ENC 3246 Communication for Engineers (WRIN)	3	CAGC FKL/Gen Ed Human and Cultural Diversity in a Global Context	3
CAFA FKL/Gen Ed Fine Arts	3	CSE Elective	3
EGN 3443 Probability and Statistics for Engineers	3	CAHU FKL/Gen Ed Humanities	3
CSE Elective	3	CIS 4910 Computer Science Project	2
CDA 4213L CMOS-VLSI Design Lab	1	Semester Hours:	14
Semester Hours:	16		

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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>.

COMPUTER ENGINEERING FACULTY

Chairperson: L. Hall; *Distinguished Professors:* L. Hall, N. Ranganathan; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegl, S. Sarkar, A. Weitzenfeld; *Associate Professors:* W. Armitage, P. Bao, A. Gaspar, A. Iamnitich, J. Ligatti, S. Katkooi, H. Zheng; *Assistant Professors:* A. Ejnoui, S. Ghosh, Y. Liu, L. Palmer, N. Paul, Y. Sun, Y. Tu; *Instructors:* H. Jeanty, T. Kouri, R. Tindell, J. Wang; *Distinguished Professor Emeritus:* A. Kandel; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

• COMPUTER SCIENCE (BCS) (CIP = 11.0101 (TRACK 1 OF 6)) TOTAL DEGREE HOURS: 120

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

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.
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.

Required Prerequisites for Entering the Computer Science Program

Students who have met the College of Engineering's admission requirements for engineering majors are assigned a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Students who have fully met the admission requirements for the major, and are in good academic standing, may declare a major in Computer Science.

Bachelor of Science in Computer Engineering and Bachelor of Science in Computer Science

1. Completion of:
 - o ENC 1101 and ENC 1102
 - o (MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282)
 - o PHY 2048 and PHY 2048L
 - o 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 (<http://www.cse.usf.edu>) 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. Continuation in the major requires successful completion of CDA 3103 and COP 3514 with the required grade as stated in the Computer Science and Engineering prerequisite statement in the College of Engineering general section.

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

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.

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 as a graduation requirement.
3. In addition to the College's graduation requirements, the Department policy concerning grades is:
 - o The minimum grade in specialization courses is a "C-", except as stated in Department admission requirements.
 - o The minimum grade in math, science, and engineering courses which are required for the degree is a "C", except as stated in Department admission requirements.

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.

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 thesis 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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 (69 hours)

Math and Science (20 credit hours)

MAC 2281 Engineering Calculus I
MAC 2282 Engineering Calculus II
MAC 2283 Engineering 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)

Electives (27 hours)

15 hours of Department Upper-Level Electives (CSE Elective)
6 hours of Department Upper-Level Electives (CSE Software Elective)
3 hours of Department Upper-Level Elective (CSE Theory Elective)
3 hours of Upper-Level Humanities, Social Sciences, or Fine Arts Elective

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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.

Foundations of Knowledge and Learning (FKL) Requirement

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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

The writing intensive and capstone design exit requirements are fully met through ENC 3246 and CIS 4250.

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

Summer

[Summer Opportunities](#)

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

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

Semester 5	Credit Hours	Semester 6	Credit Hours
COT 4400 Analysis Of Algorithms	3	ENC 3246 Communication for Engineers (WRIN)	3
CDA 4205 Computer Architecture	3	COP 4600 Operating Systems	3
CANL FKL/Gen Ed Natural Sciences (Life Science)	3	CSE Elective	3

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

EGN 3443 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
CAFA FKL/Gen Ed Fine Arts	3	CIS 4250 Ethical Issues And Professional Conduct (CPST)	3
CAGC 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
CAHU FKL/Gen Ed Humanities	3	Semester Hours:	12
Semester Hours:	15		

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

MINOR IN COMPUTER SCIENCE (BCS)

TOTAL MINOR HOURS: 18

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

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).

REQUIREMENTS FOR THE MINOR IN COMPUTER SCIENCE

This Computer Science 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.

Required Courses (12 hours)

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

Elective Courses (6 hours)

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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:

1. ENC 1101 and ENC 1102
2. (MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282)
3. PHY 2048 and PHY 2048L
4. PHY 2049 and PHY 2049L
5. Completion of 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. COT 3100 Introduction to Discrete Structures is required

GPA Requirements

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

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. Piegl, S. Sarkar, A. Weitzenfeld; *Associate Professors:* W. Armitage, P. Bao, A. Gaspar, A. Iamnitchi, J. Ligatti, S. Katkooi, H. Zheng; *Assistant Professors:* A. Ejnoui, S. Ghosh, Y. Liu, L. Palmer, N. Paul, Y. Sun, Y. Tu; *Instructors:* H. Jeanty, T. Kouri, R. Tindell, J. Wang; *Distinguished Professor Emeritus:* A. Kandel; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

• ELECTRICAL ENGINEERING (EEL) (CIP = 14.1001) TOTAL DEGREE HOURS: 128

<http://ee.eng.usf.edu/Undergraduate/curriculum.htm>

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

- 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 visit <http://ee.eng.usf.edu/about/missionObjectives.htm> for additional information.

Required Prerequisites for the Entering Electrical Engineering Program

Students who have met the Engineering's admission requirements for engineering majors carry a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Students who have fully met the below admission requirements and are in good academic standing, may declare a major in Electrical Engineering.

Bachelor of Science in Electrical Engineering

- Completion of:
 - (MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282) and (MAC 2313 or MAC 2283)
 - PHY 2048 and PHY 2048L
 - PHY 2049 and PHY 2049L
 - (CHM 2045 and CHM 2045L) or (CHS 2440 and 2440L)
- A minimum grade of C in each course and a 3.0 GPA based upon the best attempt in these courses.
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

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.

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

Students must pass all required BSEE courses, except MAP 2302, EGN 3373 and EGN 3374, with a grade of C or better (no C-).

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 thesis 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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Natural Sciences:

Courses at USF

CHM 2045/CHM 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

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

Major requirements for the B.S.E.E. Degree (95 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 (Note: EGN 3433 is not a Gordon Rule course)
CHM 2045 General Chemistry I
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 (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
EGN 3373 Introduction to Electrical Systems I
EGN 3420 Engineering Analysis

Specialization (52 credit hours)

EEE 3394 Electronic Materials
EEL 2161 EE 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 Engineering Design/Professionalism
EEL 4914 Senior Design Project (CPST)

Technical Writing (3 credit hours)

ENC 3246 Communication for Engineers (WRIN)

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Electives (12 hours)

12 hours of Department Upper-Level Electives

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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.

Foundations of Knowledge and Learning (FKL) Requirement

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

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

Foundations of Knowledge and Learning (FKL) Exit Requirement

The writing intensive and capstone design requirements are fully met through ENC 3246 and EEL4914.

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
MAC 2281 or MAC 2311	4	MAC 2282 or MAC 2312	4
CHM 2045 or CHS 2440	3	ENC 1102 Composition II	3
ENC 1101 Composition I	3	EEL 4705 Logic Design	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3	PHY 2048 General Physics I - Calculus Based (CANP)	3
CHM 2045L or CHS 2440L	1	PHY 2048L General Physics I Laboratory	1
EGN 3000L Foundations of Engineering Lab	1		
! EGN 3000 Foundations of Engineering		Semester Hours: 14	
Semester Hours: 15			

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
MAC 2283 or MAC 2313	4	CAHU FKL/Gen Ed Humanities	3
EGN 3615 Engineering Economics with Social and Global Implications (CASB)	3	EEE 3394 Electronic Materials	3
EEL 2161 Electrical Engineering Computer Methods	3	EGN 3420 Engineering Analysis	3
		EGN 3373 Introduction to Electrical Systems I	3
		EGN 3433 or MAP 2302	3

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

PHY 2049 General Physics II - Calculus Based	3	EEL 4705L Logic Laboratory	1
PHY 2049L General Physics II Laboratory	1	Semester Hours:	16
Semester Hours: 14			

Summer

Credit Hours

ENC 3246 Communication for Engineers (WRIN)	3
EGN 3374 Introduction to Electrical Systems II	3
CAHU FKL/Gen Ed Humanities	3
Semester Hours:	9

Semester 5

Credit Hours

EEL 4471 Electromagnetics	3
CAFA FKL/Gen Ed Fine Arts	3
EEL 3100 Network Analysis and Design	3
EEE 4351C Semiconductor Devices	3
EEL 3115L Laboratory I	1
EGN 3443 Probability and Statistics for Engineers	3
Semester Hours:	16

Semester 6

Credit Hours

EGN 3375 Electromechanical Systems	3
EEE 3302 Electronics I	3
EEL 4102 Linear Systems Analysis	3
EEL 4744 Microprocessor Principles and Applications	3
EEL 4423L Wireless Circuits & Systems Design Laboratory	2
EEL 4743L Microprocessor Laboratory	1
Semester Hours:	15

Summer

Credit Hours

Internship/Co-op Participation	Semester Hours: 0
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Semester 7

Credit Hours

EEL 4512C Introduction to Communication Systems	3
EEL 4657 Linear Control Systems	3
EEL 4906 Professional Issues and Engineering Design	3
Upper-Level Department Elective	3
EEL 3116L Laboratory II	1
EEL 4657L Linear Controls Laboratory	1
Semester Hours:	14

Semester 8

Credit Hours

CAGC FKL/Gen Ed Human and Cultural Diversity in a Global Context	3
EEL 4914 Senior Project Design (CPST)	3
Upper-Level Department Elective	3
Upper-Level Department Elective	3
Upper-Level Department Elective	3
Semester Hours:	15

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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>.

ELECTRICAL ENGINEERING FACULTY

Chairperson: T. Weller; *Professors:* 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, A. Raji, K. Selcuk, A. Takshi, S.W. Thomas, I. Uysal; *Instructors:* Chung Seop Jeong.

• INDUSTRIAL ENGINEERING (EIE) (CIP = 14.3501)

TOTAL DEGREE HOURS: 128

<http://imse.eng.usf.edu/academics/undergrad.asp>

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

Mission Statement

The mission of the IMSE Department is to:

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

Program Educational Objectives

Our graduates are expected to:

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

Please visit <http://imse.eng.usf.edu/about/mission.asp> for additional information.

Required Prerequisites for Entering the Industrial Engineering Program

Students who have met the College of Engineering's admission requirements for engineering majors are assigned a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental Engineering courses.

Students who have fully met the below admission requirements and are in good academic standing, may declare a major in Industrial Engineering.

Bachelor of Science in Industrial Engineering

1. Completion of:
 - (MAC 2311 or MAC 2281) and (MAC 2312 or MAC 2282) and (MAC 2313 or MAC 2283)
 - PHY 2048 and PHY 2048L
 - PHY 2049 and PHY 2049L
 - (CHM 2045 and CHM 2045L) or (CHS 2440 and 2440L)

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

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Grading Requirement

A minimum grade in degree required math, science, engineering and specialization courses is a C or better, C- is insufficient.

Admission to the IMSE department requires successful completion of the following USF courses (or equivalent): Engineering Calculus I, II, and III, General Chemistry I for Engineers (with lab) and General Physics I and II (Calculus-based with labs), with a 2.4 overall GPA in these courses based on best attempt. The minimum acceptable grade in any given course is a C; grades of C- are insufficient.

Other Requirements

The Department has the following policies:

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

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 thesis 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/CHM 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

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

Major requirements for the B.S.I.E. Degree (102 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 (Note: EGN 3433 is not a Gordon Rule course)

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

CHS	2440	General Chemistry for Engineers
CHS	2040L	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 (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

Specialization (48 credit hours)

ESI	2009	Introduction to Engineering Programming
EIN	4312C	Work Analysis
EIN	4621	Manufacturing Processes
ESI	4312	Deterministic Operations Research
EIN	4333	Production Control
ESI	4221	Industrial Statistics and Quality Control
ESI	4313	Probabilistic Operations Research
ESI	4620	Design of Industrial Information Systems
ESI	4606	Engineering Analytics I
EIN	4364	Facilities Design and Cost Analysis
ESI	4244	Design of Experiments
ESI	4523	Systems Simulation
EIN	4243C	Human Factors
EIN	4601C	Automation and Robotics
EIN	4891	Capstone Design (CPST)
ESI	4607	Engineering Analytics II

Technical Writing (3 credit hours)

ENC	3246	Communication for Engineers (WRIN)
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Electives (5 hours)

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

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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

Foundations of Knowledge and Learning (FKL) Requirement

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

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

Foundations of Knowledge and Learning (FKL) Exit Requirement

The writing intensive and capstone design exit requirements are fully met through ENC 3246 and EIN 4891.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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
MAC 2281 or MAC 2311	4	MAC 2282 or MAC 2312	4
CHM 2045 or CHS 2440	3	ENC 1102 Composition II	3
ENC 1101 Composition I	3	CAHU FKL/Gen Ed Humanities	3
CASB FKL/Gen Ed Social and Behavioral Sciences	3	PHY 2048 General Physics I - Calculus Based (CANP)	3
CHM 2045L or CHS 2440L	1	CAFA FKL/Gen Ed Fine Arts	3
EGN 3000L Foundations of Engineering Lab	1	PHY 2048L General Physics I Laboratory	1
! EGN 3000 Foundations of Engineering		Semester Hours: 17	
Semester Hours: 15			

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
MAC 2283 or MAC 2313	4	EGN 1113 Introduction to Design Graphics	3
CAHU FKL/Gen Ed Humanities	3	EGN 3373 Introduction to Electrical Systems I	3
PHY 2049 General Physics II - Calculus Based	3	EGN 3433 or MAP 2302	3
EGN 3443 Probability and Statistics for Engineers	3	EGN 3365 Materials Engineering I	3
EGN 4450 Introduction to Linear Systems	2	EGN 3311 Statics	3
PHY 2049L General Physics II Laboratory	1	Semester Hours: 15	
Semester Hours: 16			
Summer		Credit Hours	
EGN 3615 Engineering Economics with Social and Global Implications (CASB)		3	
CAGC FKL/Gen Ed Human and Cultural Diversity in a Global Context		3	
EGN 3343 Thermodynamics I		3	
		Semester Hours: 9	

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Summer		Credit Hours	
Internship/Co-op Participation		Semester Hours: 0	
Semester 7	Credit Hours	Semester 8	Credit Hours
ESI 4244 Design of Experiments	3	EIN 4601C Automation and Robotics	3
ESI 4606 Engineering Analytics I	3	EIN 4891 Capstone Design (CPST)	3
EIN 4364 Facilities Design and Cost Analysis	3	ESI 4607 Engineering Analytics II	3
ESI 4523 Systems Simulation	3	EIN 4243C Human Factors	3
Upper-Level Department Elective	2	Semester Hours: 12	
Semester Hours: 14			

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 Industrial Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

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:* S. Huang, H. Yang, B. Zeng; *Instructors:* P. Anzalone, P. Schnitzler.

• INFORMATION SYSTEMS (EIF) (CIP = 11.0401)

TOTAL DEGREE HOURS: 120

This major is accepting no new admission because it was suspended effective Fall 2011. For information regarding majors within the Department of Computer Science and Engineering, please contact 813-974-3652.

• INFORMATION TECHNOLOGY (ITC) (CIP = 11.0103 - TRACK 1 OF 4)

TOTAL DEGREE HOURS: 120

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

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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

Information Technology Program Educational Objectives:

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 suitable technologies and apply fundamental computing knowledge to solve business problems.

Entrance Requirements

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.

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

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

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

Departmental Policies

In addition to the University's graduation requirements, the program has the following policies:

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

Grading Requirement

Only grades of C and above in IT courses can be used to fulfill graduation requirements. (grade of C- is insufficient).

STATE MANDATED COMMON COURSE PREREQUISITES

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-

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

granting department, must be taken at USF to receive the baccalaureate degree. Prospective transfer students may contact the College's Office of Student Services (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
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 (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
COP 1930	Special Topics for Information Technology: Introduction to databases for IT
COP 2930	Special Topics for Information Technology: IT Programming Concepts
COP 2931	Special Topics for Information Technology: Object-Oriented Programming for IT
COP 3515	Program Design for Information Technology
CGS 3303	IT Concepts
CEN 3722	Human Computer Interfaces for Information Technology
CDA 3101	Computer Organization for Information Technology
INR 3033	International Political Cultures
EEL 4782	Computer Information Networks for Information Technology
EEL 4782L	Information Networks Laboratory for Information Technology
EEL 4854	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	IT Ethics
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.

Electives (15 hours)

15 hours of IT Approved 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
EGN 3000 Foundations of		MAC 1147 Precalculus Algebra and	4

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Engineering		Trigonometry	
General Elective	3	ENC 1102 Composition II	3
ENC 1101 Composition I	3	EGN 3000L Foundations of Engineering Lab	1
CAGC FKL/Gen Ed Human and Cultural Diversity in a Global Context	3	PSY 2012 Introduction to Psychological Science	3
COP 1930 Special Topics for Information Technology	3	COP 2930 Special Topics for IT (IT Programming Concepts)	3
Semester Hours:	12	Semester Hours:	14

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
ECO 2013 Economic Principles (Macroeconomics)	3	PHY 2020 Conceptual Physics	3
CANL FKL/Gen Ed Natural Sciences (Life Science)	3	MAD 2104 Discrete Mathematics	3
STA 2023 Introductory Statistics I	3	CAFA FKL/Gen Ed Fine Arts	3
COP 2931 Special Topics for Information Technology (IT Object-Oriented Programming)	3	CAHU FKL/Gen Ed Humanities	3
General Elective	3	Semester Hours:	12
Semester Hours:	15		

Summer	Credit Hours
CGS 3303 IT Concepts	3
General Elective	3
CAHU FKL/Gen Ed Humanities	3
Semester Hours:	9

Semester 5	Credit Hours	Semester 6	Credit Hours
ENC 3246 Communication for Engineers	3	ETG 4931 Special Topics in Technology I: Advanced Written & Oral Communication Skills for IT	3
CEN 3722 Human Computer Interfaces for Information Technology	3	EEL 4782 Computer Information Networks for Information Technology	3
INR 3033 International Political Cultures	3	CDA 3101 Computer Organization for Information Technology	3
COP 3515 Program Design for Information Technology	3	EEL 4854 Data Structures and Algorithms for Information Technology	3
Semester Hours:	12	IT Approved Elective	3
		EEL 4782L Information Networks Laboratory for Information Technology	1
		Semester Hours:	16

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Semester 7	Credit Hours	Semester 8	Credit Hours
COP 4703 Database Systems for Information Technology	3	IT Approved Elective CPST	3
COP 4610 Operating Systems for Information Technology	3	COP 4930 Information Technology Seminar	1
CEN 4031 Software Engineering Concepts for Information Technology	3	CIS 4253 IT Ethics	3
IT Approved Elective	3	CIS 4935 Senior Project in Information Technology	5
IT Approved Elective	3	IT Approved Elective	3
Semester Hours:	15	Semester Hours:	15

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.

MINOR IN IT GENERAL MINOR (ITG)

TOTAL MINOR HOURS: 15

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

The IT General minor is 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.

REQUIREMENTS FOR THE MINOR IN IT GENERAL MINOR

This Information Technology General minor is a 15-credit hour program that is open to all students, except for Information Technology, Computer Science or Computer Engineering majors, who meet the prerequisites listed.

Required Courses (3 hours)

CGS 3303 IT Concepts (a prerequisite, any Physics course, is required for this course)

Elective Courses (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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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.

MINOR IN IT TECHNICAL MINOR (ITE)

TOTAL MINOR HOURS: 24

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

The IT Technical minor 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.

REQUIREMENTS FOR THE MINOR IN IT TECHNICAL MINOR

This Information Technology Technical Minor is a 24 credit hour program that is open to all students, except for Information Technology, Computer Science or Computer Engineering majors, who meet the prerequisites listed.

Required Courses (9 hours)

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)

Elective Courses (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

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.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

INFORMATION TECHNOLOGY FACULTY

Chairperson: L. Hall; *Distinguished Professors:* L. Hall, N. Ranganathan; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, M. Labrador, R. Perez, L. Piegl, S. Sarkar, A. Weitzenfeld; *Associate Professors:* W. Armitage, P. Bao, A. Gaspar, A. Iamnitchi, J. Ligatti, S. Katkooi, H. Zheng; *Assistant Professors:* A. Ejnoui, S. Ghosh, Y. Liu, L. Palmer, N. Paul, Y. Sun, Y. Tu; *Instructors:* H. Jeanty, T. Kouri, R. Tindell, J. Wang; *Distinguished Professor Emeritus:* A. Kandel; *Professors Emeritus:* H. Glass, D. Rundus, M. Varanasi.

• MECHANICAL ENGINEERING (EME) (CIP = 14.1901) TOTAL DEGREE HOURS: 128

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

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.

Required Prerequisites for Entering the Mechanical Engineering Program

Students who have met the College of Engineering's admission requirements for engineering majors are assigned a major code of "Engineering" until they have completed the prerequisite requirements for departmental admission. Unless otherwise stated, the minimum acceptable grade in the math and science prerequisites is a grade of C or higher (C- is insufficient). Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses.

Students who have fully met the below admission requirements and are in good academic standing, may declare a major in Mechanical Engineering.

Minimum Admission Requirements for Department of Mechanical Engineering

1. 2.0 overall GPA
2. 3.0 GPA in Calculus I, Calculus II, and General Physics I based on best attempts.

Minimum Continuation Requirements for Department of Mechanical Engineering

1. 2.0 overall GPA, 2.0 EGN engineering GPA and 2.0 EML specialization GPA
2. C in both EML 3500 Mechanics of Solids and EGN 3343 Thermodynamics 1

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

3. C- in all other EGN and EML prerequisite courses

The minimum admission requirements for students entering the Department of Mechanical Engineering are (1) a 2.0 overall GPA, and (2) a 3.0 GPA in Calculus I, Calculus II, and General Physics I based on best attempts.

The minimum continuation requirements beyond the first semester in the Department of Mechanical Engineering are (1) 2.0 overall GPA, 2.0 EGN engineering GPA and 2.0 EML specialization GPA, (2) C in both EML 3500 Mechanics of Solids and EGN 3343 Thermodynamics 1, and (3) C- in all other EGN and EML prerequisite courses.

GPA Requirements

Students in the Mechanical Engineering Department must have and maintain a minimum 2.00 GPA in EGN engineering and EML specialization courses, as well as a minimum overall and USF GPA of 2.00.

Course Grade Requirement

A grade of C- is the minimum acceptable grade for EGN and EML courses which are prerequisites to other EGN and EML courses.

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 thesis 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.

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
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 MECHANICAL ENGINEERING TOTAL MAJOR HOURS: 104

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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 Note: It is recommended students take EGN 3615 to fulfill one of the CASB/FKL requirement, but it is not a required course.
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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Electives (12 hours)

12 hours of Upper-Level Departmental Electives (Technical Design Elective)

Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the major. 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.

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.

Foundations of Knowledge and Learning (FKL) Requirement

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

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

Foundations of Knowledge and Learning (FKL) Exit Requirement

The writing intensive and capstone design exit requirements are fully met through EML 4551 and ENC 3246.

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

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

Summer

[Summer Opportunities](#)

Semester 3	Credit Hours	Semester 4	Credit Hours
MAC 2283 or MAC 2313	4	MAP 2302 Differential Equations	3
EGN 3615 Engineering Economics with Social and Global Implications (CASB)	3	EGN 3321 Dynamics	3
PHY 2049 General Physics II - Calculus Based	3	EML 3500 Mechanics of Solids	3
EGN 3311 Statics	3	EGN 3343 Thermodynamics I	3
PHY 2049L General Physics II Laboratory	1	CASB FKL/Gen Ed Social and Behavioral Sciences	3
Semester Hours: 14		Semester Hours: 15	

Summer

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

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Semester Hours: 15

Semester Hours: 15

Summer		Credit Hours	
Internship/Co-op Participation		Semester Hours: 0	
Semester 7	Credit Hours	Semester 8	Credit Hours
EML 4302 Mechanical Engineering Laboratory II	3	EML 4551 Capstone Design (CPST)	3
EML 4123 Heat Transfer	3	EML 4312 Mechanical Controls	3
EML 4220 Vibrations	3	Upper-Level Department Elective	3
Upper-Level Department Elective	3	Upper-Level Department Elective	3
Upper-Level Department Elective	3	CAHU FKL/Gen Ed Humanities	3
Semester Hours: 15		Semester Hours: 15	

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 Mechanical Engineering is accredited by the Engineering Accreditation Commission of ABET, <http://www.abet.org>.

MECHANICAL ENGINEERING FACULTY

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

MINOR IN BIOMEDICAL ENGINEERING (EBI)

TOTAL MINOR HOURS: 15

<http://chbme.eng.usf.edu>

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

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

No course used for the major may be used for the minor.

REQUIREMENTS FOR THE MINOR IN BIOMEDICAL ENGINEERING

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

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2014-2015 UNDERGRADUATE CATALOG

Required Courses (6 hours)

- BME 4100 Biomedical Engineering
- BME 4406 Engineering of Biological Systems

Elective Courses (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 4313C 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:

1. Biology I: BSC 2010
2. Calculus II MAC 2282, MAC 2242, MAC 2233 or MAC 2312
3. Physics II PHY 2049 or PHY 2054
4. General Chemistry II: CHM 2046

No course used for the major may be used for the minor.

Other Requirements

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