

COLLEGE OF ENGINEERING

UNIVERSITY OF SOUTH FLORIDA 2012-2013 UNDERGRADUATE CATALOG

MISSION STATEMENT

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

- Providing a high quality education for our engineering 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.

We 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, we lead by example and pass these attributes on to our students, empowering them to be creative and innovative engineering professionals in the 21st century as their work influences and impacts humanity.

DEPARTMENTS AND PROGRAMS

The College of Engineering offers undergraduate and graduate programs to prepare students for a broad spectrum of professional careers in engineering. Laboratory experiences, as well as real-world participation in technological problem solving, are key aspects of a professional engineer's education. The laboratory and research facilities of the College of Engineering, close collaboration with engineering professional societies and the many industries in the metropolitan Tampa Bay area provide a wide range of experiential learning opportunities for engineering students at the University of South Florida. The College of Engineering offers undergraduate degrees in Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Industrial Engineering, and Mechanical Engineering. In addition, the College offers minors in Biomedical Engineering and Computer Science. 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 program leading to a Master of Science degree in a designated Engineering discipline. The supervision of the academic programs is the function of the administrative departments together with several coordinators. Each department is responsible for specific professional programs, faculty, laboratories, and student advising.

The Bachelor of Science in Computer Science program is accredited by the Computing Accreditation Commission of the Accreditation Board for Engineering and Technology (CAC of ABET). The engineering programs of the College (Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Industrial Engineering and Mechanical Engineering) are accredited by the Engineering Accreditation Commission of the Accreditation Board for Engineering and Technology, Inc. (ABET), 111 Market Place, Suite 1050, Baltimore, MD 21202-4012 - telephone: (410) 347-7700.

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

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

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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 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.

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.

Cooperative Education Programs

The USF Career Center's Cooperative Education (Co-op) program provides placement services for students interested in cooperative education 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 sophomore year and pursue actual Co-op employment during their junior and senior years.

Research Experiences for Undergraduate Students

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.

Accelerated Programs Leading to the Bachelor and Master of Science Degrees in Engineering

Well qualified students who, at the beginning of their senior year, are clearly interested in graduate study are invited to pursue an accelerated program of study leading simultaneously to the Bachelor of Science and Master of Science in Engineering.

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. Many enter the Accelerated program in the fourth year to pursue the combined Bachelors and Masters programs in Engineering. 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 Engineering 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 must follow a program to overcome their deficiencies. Alternatives for these students, classified "Pre-Engineering," include preparatory coursework at the University of South Florida or other regionally accredited institutions of higher learning.

Student Laptop Computer Requirement

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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.

Undergraduate Admission to the College of Engineering

Students apply to the College of Engineering upon initial entry to USF by declaring Engineering as their intended major on their admissions application.

College of Engineering Admission Requirements for First Time in College Students

First time in college students meeting the criteria below are granted direct entry to the College. Those who do not are classified "Pre-Engineering." Pre-Engineering students are fully admitted to the College after satisfactorily completing Calculus I and II and Physics I with lab. Additional requirements must be met prior to admission to specific degree programs.

- a. Admitted to the University of South Florida as a degree seeking student;
- b. Test Scores:
 - SAT—combined minimum score of 1200 with a minimum quantitative score of 600 OR
 - ACT—combined minimum score of 26 and ACT mathematics minimum score of 26

College of Engineering Admission Requirements for Transfer Students

1. Transfer students must meet the following minimum requirements:
 - a. Admitted to the University of South Florida as a degree seeking student
 - b. Minimum GPA of 2.0 in each of the following categories: overall undergraduate GPA, math and science courses (best attempt), engineering courses; courses within the major.
 - c. Must have earned 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. The Department of Computer Science and Engineering has continuation requirements based on two attempts – see the Required Prerequisites for Entering Engineering Programs. Registration that is canceled for non-payment is considered an attempt.
 - d. Completion of Calculus I and II and Physics I with lab, with minimum grades of C (C- is insufficient).Transfer students who meet criteria a., b. and c. but not d. will be classified pre-engineering until criteria d. is met. Transfer students who do not meet criteria a, b, or c will not be admitted to the College of Engineering.
2. Florida College System transfer students that have met the minimum criteria above and have completed the courses shown below with the minimum grades and GPA required by the Academic Department are accepted directly into the College of Engineering and to the specific program.

Mathematics:

Courses at USF

MAC 2281
MAC 2282
MAC 2283
MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
MAC 2312/MAC 2282 (4)
MAC 2313/MAC 2283 (4)
MAP 2302/ MAP X305(3)

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L
PHY 2048/PHY 2048L
PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C or CHS X440/CHM X045L* (4)
PHY X048C or PHY X043/X048L (4)
PHY X049C or PHY X044/PHY X049L (4)

*or CHS X440 if 4 credits with included laboratory

Note: Computer Science: Transfer students into the Computer Science program from a Florida College System institution are not required to have MAP 2302 or the Chemistry course indicated above.

Transfer Credit

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

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While credit work from other institutions may be granted subject to the conditions of the previous paragraph, at least 30 credit hours including a *minimum* number of semester hours of engineering coursework, specified by the degree-granting department, must be taken at USF to receive the baccalaureate degree.

Prospective transfer students may contact the College's Office of Student Services (813/974-2684) to request an assessment.

Required Prerequisites for Entering Engineering Programs

Students in the College of Engineering carry a major code of EGU (engineering) until they have completed the pre-requisite requirements for departmental admission. Engineering students who have fully met the admission requirements for their intended major, and are in good academic standing, may declare a major in one of the following bachelor's degree programs: Bachelors of Science in Chemical Engineering, Civil Engineering, Computer Engineering, Computer Science, Electrical Engineering, Industrial Engineering or Mechanical Engineering. The College of Engineering is not accepting new students for the four year Bachelor of Science- program in Information Systems at this time.

Departmental admissions requirements vary by program. Students considering transferring to USF should familiarize themselves with the requirements for their intended department as early as possible. Students admitted to the University of South Florida and the College of Engineering must qualify for the program of their choice by successfully meeting the requirements below. Unless otherwise stated, the minimum acceptable grade in math and science prerequisites is a grade of C or higher (C- is insufficient). Minimum acceptable grades for math, science and engineering courses, as they pertain to specific degree programs are defined by the academic departments. Students are *strongly encouraged to familiarize themselves with departmental guidelines*.

Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Once admitted, individual departments may have continuation requirements which specify minimum performance standards in core engineering courses for the discipline which must be met before further registration in the Department is granted.

The Department of Chemical & Biomedical Engineering

Bachelor of Science in Chemical Engineering

- Completion of
 - MAC 2311 or MAC 2281, MAC 2312 or MAC 2282, MAC 2313 or MAC 2283
 - PHY 2048, PHY 2048L, PHY 2049, PHY 2049L
 - CHM 2045, CHM 2045L
- A minimum grade of C in each course.
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

The Department of Civil & Environmental Engineering

Bachelor of Science in Civil Engineering

- Completion of
 - MAC 2311 or MAC 2281, MAC 2312 or MAC 2282, MAC 2313 or MAC 2283
 - PHY 2048, PHY 2048L, PHY 2049, PHY 2049L
 - CHM 2045, CHM 2045L
- A 2.3 GPA (based on best attempt) in these prerequisites
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

The Department of Computer Science & Engineering

Bachelor of Science in Computer Engineering and

Bachelor of Science in Computer Science

Admission to the Department as a Pre-CSE student requires:

- Completion of:
 - ENC 1101 and ENC 1102
 - MAC 2311 or MAC 2281, MAC 2312 or MAC 2282
 - PHY 2048, PHY 2048L, PHY 2049, PHY 2049Lwith a 3.0 GPA (based on best attempt in these courses) and a minimum grade of "C" in each course (grades of "C-" are insufficient).
- Completion of COP 2510 (or equivalent) with a minimum grade of "B" (grade of "B-" is insufficient)
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

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Admission to one of the two major degree tracks is granted by also meeting the following continuation requirements

- Completion of CDA 3103 and COP 3514 with a minimum grade 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.
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

The Department of Electrical Engineering

Bachelor of Science in Electrical Engineering

- Completion of:
MAC 2311 or MAC 2281, MAC 2312 or MAC 2282, MAC 2313 or MAC 2283
PHY 2048, PHY 2048L, PHY 2049, PHY 2049L
CHM 2045, CHM 2045L
- 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

The Department of Industrial & Management Systems Engineering

Bachelor of Science in Industrial Engineering

- Completion of:
MAC 2311 or MAC 2281, MAC 2312 or MAC 2282, MAC 2313 or MAC 2283
PHY 2048, PHY 2048L, PHY 2049, PHY 2049L
CHM 2045, CHM 2045L
- A minimum grade of C in each course.
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

The Department of Mechanical Engineering

Bachelor of Science in Mechanical Engineering

- Completion of:
MAC 2311 or MAC 2281, MAC 2312 or MAC 2282, MAC 2313 or MAC 2283
PHY 2048, PHY 2048L, PHY 2049, PHY 2049L
CHM 2045, CHM 2045L
- A minimum grade of C in each course and a 2.50 GPA based upon all attempts in these courses (grade forgiveness is honored in this calculation).
- A minimum overall GPA of 2.0
- A minimum USF GPA of 2.0

ACCELERATED PROGRAMS LEADING TO BACHELOR'S AND MASTER'S DEGREES IN ENGINEERING

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:

1. The opportunity of taking some graduate courses during the fourth year and deferring the taking of some senior courses to the fifth year.
2. Up to six credit hours, to be determined by program, may be counted toward both degrees in some degree programs.

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 16 upper level engineering credits completed

Meet or exceed the graduate program entrance requirements of the department.

Engineering 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 freshman year. Professional advisors in the College of Engineering provide individualized academic planning and guidance.

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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 responsibility for seeing that all performance standards and graduation requirements are met rests with the student.*

Advising Office

Tampa Campus: TECO Energy Hall, Room 1302, (813) 974-2684.

Preliminary Coursework for Engineering Students

The College of 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 Engineering major should be aware of specific requirements. Students may consult the College's Advising Office for detailed information.

1. University Foundations of Knowledge and Learning Core Curriculum (FKL) Requirements

All students are required to take 42 semester hours to complete the University FKL requirements. Thirty-six (36) semester hours will satisfy the FKL core course requirements and 6 semester hours will satisfy the exit requirements. Students in the College of Engineering may take a second physical science course in place of the life science requirement. In addition, 12 hours considered Gordon Rule Communication (6A) courses must be completed. For Engineering students, these are ENC 1101, ENC 1102, ENC 3246, and an additional course. The fourth course is selected from any general education or departmental course that has been certified Gordon Rule Communication (6A) by the USF Undergraduate Council.

2. Mathematics and Science Core Requirements

For students in the engineering programs, the mathematics coursework consists of a Calculus for Engineers sequence (or a calculus sequence of equivalent level), Differential Equations, and additional hours of designated courses supportive of the student's selected field of specialization, as specified by the department. Science coursework includes the Physics with Calculus sequence and General Chemistry course(s) depending on the degree-granting program. Students whose preparation is insufficient to enter the Calculus for Engineers are required to take supplementary algebra and trigonometry courses.

Grading Policies

1. S/U Grading Policy

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

2. I Grade Policy

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

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

3. Minimum Acceptable Grade in Required Courses

The minimum acceptable grade in math and science prerequisites is a C (C- is insufficient). The minimum acceptable grade in engineering 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 engineering department as well as the minimum grade required in engineering courses. Grades higher than the minimum of "C" may be indicated.

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Minimum Performance and Graduation Requirements

1. Minimum Requirements

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

- a. Overall Undergraduate GPA
- b. USF GPA
- c. Math and Science courses (best attempt)
- d. Engineering Courses
- e. Courses within the major

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 advisors. 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 engineering students.

All undergraduate students with student classifications of engineering or pre-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. Registration that is canceled for non-payment is also considered an attempt. 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 admission to a degree track and continuation in the Department of Computer Science and Engineering, attempts in CDA 3103 and COP 3514 are limited to two. See "Required Prerequisites for Entering Engineering Programs".

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 thus 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.

2. Residency Requirement

Transfer students must complete a minimum number of approved specialization courses in the USF degree granting department. 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 for each bachelor's degree. The University residency requirement for each bachelor's degree must also be met. General engineering courses are not considered specialization courses.

A dual degree student must meet the requirements of each degree program and have a minimum of 18 approved specialization hours taken in the degree granting department beyond those specialization hours required for the first degree.

3. 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.

4. 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 regarding academic dishonesty.)

5. Grievance Procedure

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

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6. 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.

7. Graduation Application Procedures and Deadlines

Each engineering student is required to complete an application for graduation and check list. Students should schedule an appointment with the Department Undergraduate Coordinator to review graduation qualifications and obtain departmental signatures well in advance of the College graduation application deadline. Approved applications must be submitted to the College of Engineering Advising Office the term prior to the semester in which graduation is sought. Graduation applications are due on the dates indicated below.

August 1st for Fall Graduation
November 1st for Spring Graduation
April 1st for Summer Graduation

The Departments may have earlier graduation application deadlines. The Department deadline takes precedence over the College deadline.

Department of Chemical & Biomedical Engineering

Undergraduate Degree Offered:

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

Graduate Degrees Offered:

Master of Science in Chemical Engineering (M.S.C.H.)

Master in Chemical Engineering (M.C.H.E.)

Master of Engineering (M.E.)

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

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

Doctor of Philosophy in Chemical Engineering (Ph.D.)

Doctor of Philosophy in Engineering Science (Ph.D.)

Doctor of Philosophy in Biomedical Engineering (Ph.D.)

This department offers coursework and study in all areas fundamental to Chemical & Biomedical Engineering. Engineering specialization courses, together with mathematics, physics, chemistry, other interdisciplinary engineering fundamentals, and liberal arts courses, provide the basis for long-range professional progress. Because of the many professional areas available for employment to the chemical engineer, the students are also required to take a number of electives from areas such as biotechnology, materials, and environmental engineering. These electives are designed to broaden the experience and, therefore, the employment possibilities of our graduates. The Chemical & Biomedical Engineering Department also offers a sequence of courses in chemical engineering science, biotechnology and biomedical engineering.

A sequence of courses in the engineering aspects of biotechnology is currently available within the Chemical Engineering program. Topics include applied microbiology, fermentation, enzyme technology, cell separation technology, biomedical engineering, biomaterials, biotechnology, and biomechanics.

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.

Solutions of modern societal and scientific problems often require the use of chemical engineering skills. Chemical and biomedical engineering students must have access to a personal computer during their last two years of study. Those who do not own one will be severely disadvantaged.

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 Education Objectives

1. Demonstrate professional engineering competence by holding positions of increasing responsibility in industry,

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- 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.

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

• CHEMICAL ENGINEERING (ECH) (CIP = 14.0701)

Four-Year Curriculum - Chemical Engineering

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

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

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 the Florida College System Institution that will be accepted in the Math/Science/Engineering areas:

Mathematics:

Courses at USF

MAC 2281
MAC 2282
MAC 2283
MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
MAC 2312/MAC 2282 (4)
MAC 2313/MAC 2283 (4)
MAP 2302/ MAP X305(3)

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L
CHM 2046/CHM 2046L
PHY 2048/PHY 2048L
PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C or CHS X440/CHM 045L (4)
CHM X046/L or CHM 046C
PHY X048C or PHY X043/X048L (4)
PHY X049C or PHY X044//PHY X049L (4)

Chemical & Biomedical Engineering Admissions Requirements

Students must have completed the equivalent USF Engineering Calculus General Physics and Chemistry courses with a C or better in each course; must have a USF and an overall GPA of 2.0 or better.

Chemical Engineering (ECH), BSCH, 131

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Laboratory	1
EGN 3000	Foundations of Engineering	1
ENC 1101	Composition I	3

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MAC 2281	Engineering Calculus I	4
XXX XXXX	Fine Arts Elective	3
XXX XXXX	Human Cultural Diversity and Global Context Elective	<u>3</u>
Total		18

Spring Semester - Year 1

CHM 2046	General Chemistry II	3
CHM 2046L	General Chemistry II Laboratory	1
ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Laboratory	<u>1</u>
Total		15

Fall Semester - Year 2

EGN 3443	Engineering Statistics I	3
MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Laboratory	1
XXX XXXX	Social and Behavioral Sciences Elective	3
XXX XXXX	Humanities Elective	<u>3</u>
Total		17

Spring Semester - Year 2

ECH 3023C	Material and Energy Balances	4
EGN 3343	Thermodynamics I	3
EGN 3433	Modeling and Analysis of Engineering Systems or MAP 2302 Differential Equations	3
XXX XXXX	Social and Behavioral Sciences Elective	<u>3</u>
Total		13

Summer Term - Year 2

CHM 2210	Organic Chemistry I	3
CHM 2210L	Organic Chemistry Laboratory I	2
XXX XXXX	Humanities Elective	3
ENC 3246	Communications for Engineers	<u>3</u>
Total		11

Fall Semester - Year 3

ECH 4123	Chemical Engineering Thermodynamics	3
ECH 4264	Transport Phenomena	4
ECH 4846	Numerical Methods in Chemical Engineering	4
XXX XXXX	Department Upper-Level Elective	<u>3</u>
Total		14

Spring Semester - Year 3

CHM 2211	Organic Chemistry II	3
CHM 2211L	Organic Chemistry II Laboratory	2
ECH 3702	Instrument Systems I	3
ECH 4265C	Mass Transfer Operations	4
BME 4406	Engineering of Biological Systems	<u>3</u>
Total		15

Fall Semester - Year 4

ECH 3240L	Chemical Engineering Lab I	3
ECH 4415C	Reaction Engineering	4
ECH 4605	Product and Process Systems Engineering	3
EMA 4003	Introduction to Materials Science	3
XXX XXXX	Department Upper-Level Elective	<u>3</u>
Total		16

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Spring Semester - Year 4

ECH 4241L	Chemical Engineering Laboratory II	3
ECH 4323C	Process Dynamics and Control	3
ECH 4615	Product and Process Design	3
XXX XXXX	Department Upper-Level Elective	3
	Total	<u>12</u>
TOTAL CREDIT HOURS TO DEGREE		131

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

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

Biomedical Engineering Minor

This biomedical engineering minor is a 15 credit hour program that is open to all engineering majors and other students that meet the prerequisites listed below. For engineering majors, at least 9 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 undergraduate advisor prior to starting this minor program. Departments within the College of Engineering are currently developing additional courses that will be added to the list of courses that can be applied to this minor, so consultation with the advisor will insure that students are informed of all offered 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

Required Courses (6 hours)

ECH 4930	Special Topics in Chemical Engineering*	3
BME 4406	Engineering of Biological Systems	3

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

ECH 6417	Bioseparations	3
ECH 4931	Special Topics in Chemical Engineering: Introduction to Biomedical Engineering**	3
PHZ 4702	Applications of Physics to Biology & Medicine I	4
PHZ 4703	Applications of Physics to Biology & Medicine II	4
BCH 3023	Introductory Biochemistry	3
EIN 4313C	Human Factors	3
BME 5006	Theory and Design of Bioprocesses	3
EIN 5245	Work Physiology/Biomechanics	3
BME 5040	Pharmaceutical Engineering	2
ECH 5748	Selected Topics in Biomedical Engineering**	1-10
BME 5748	Selected Topics in Biomedical Engineering **	3

*Please see academic advisor for required special topics courses.

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

Chemical & Biomedical 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; J. Wiencek, *Associate Professors:* N. Alcantar, M. Jaroszeski C. Passaglia, R. Toomey; *Assistant Professors:* J. Kuhn, P. Korla, A. Pyayt; *Interdisciplinary Professors:* D. Edins, A. Sagues, J.P. Walton; *Courtesy Faculty:* S. Eschrich, T. Fawcett, M. Frankle, A. Ghaneh-Fard, L. Heller, R. Heller, W. Johnson, D. Keefe, S. Kranc, J. Lloyd, D. McMillan, K. Muffly, L. Ondrovic, E. Persson, B. Santoni, B. Schulz, S. Sunol.

Department of Civil & Environmental Engineering

Undergraduate Degree Offered:

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

Graduate Degrees Offered:

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Master of Science in Civil Engineering (M.S.C.E.)
Master of Science in Environmental Engineering (M.S.E.V.)
Master of Civil Engineering (M.C.E.)
Master of Environmental Engineering (M.E.V.E.)
Doctor of Philosophy in Civil Engineering (Ph.D.)
Doctor of Philosophy in Engineering Science (Ph.D.)

This department offers course work and study pertinent to Civil Engineering, Engineering Mechanics, Material Science, and Environmental Engineering. Areas of concentration are Environmental/Water Resources Engineering; Structures/Materials/Geotechnical Engineering; and Geotechnical/Transportation Engineering.

Students completing the program may enter the profession as engineers in civil, structural, geotechnical, transportation, water resources, environmental, hydraulics, or materials disciplines. All of these disciplines share the need for knowledge in the areas of engineering mechanics, civil engineering, material science, and environmental engineering. Through choice of the proper area of concentration, a student has the opportunity to channel academic studies specifically towards his/her career choice.

Graduates of the program may commence their engineering careers in either industry, engineering consulting firms, or public service at the federal, state, or local level. Initial assignments may include planning, design and implementation of water resources systems; planning and design of transportation and housing systems; regional planning, design, and management for abatement of air, water and solid waste pollution problems; design of bridges and single and multistory structures; and supervision of construction projects.

Mission Statement

The Civil Engineering Program of the Department of Civil and Environmental Engineering at the University of South Florida will provide undergraduate students with strong, broad-based, engineering education which gives them the basic intellectual and organization skills that allow them to work with complex systems with technological, social and environmental components. As many of the Program's graduates begin work upon graduation in industry or with governmental organizations, the curriculum is designed to prepare students for these roles by requiring a number of courses in the various fields of civil engineering and by providing limited specialization in one given area. The curriculum is designed to encourage lifelong learning and to prepare students for undertaking advanced studies in engineering or in other professional areas.

Program Educational Objectives Associated with the Mission Statement

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

1. The Civil Engineering Program at the University of South Florida has as a program educational objective that graduates, within 3-6 years after graduation, can obtain positions in civil engineering firms or government agencies where they:
 - deal effectively with clients, the public, or other engineering groups,
 - communicate effectively with co-workers and the public, and
 - are effective members of teams involved in the design and/or construction of civil engineering projects.
2. The Civil Engineering Program at the University of South Florida has as a program educational objective that graduates, within 3-6 years after graduation, are continuing their professional development by extending their professional knowledge through independent learning, continuing educational courses, conferences, workshops, short courses, and/or graduate study.
3. The Civil Engineering Program at the University of South Florida has as a program educational objective that graduates, within 3-6 years after graduation, that are working in engineering related public or private organizations encouraging professional registration will have made appropriate progress towards achieving that registration.

Concentrations

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:

1. Participate in mandatory advising prior to each term;
2. Participate in Department assessment activities and successfully complete an exit interview before graduating;
3. Maintain a C- or better in EGN 3311 Statics; EGN 3331 Mechanics of Materials; EGN 3353 Basic Fluid Mechanics; and EGN 3365 Materials Engineering to continue in the program, including a 2.5 GPA (best

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- attempt) in all these courses;
4. Earn a C- or better in all engineering courses used to meet graduation requirements;
 5. Consider the advice of the college to complete and pass the Fundamentals of Engineering Exam (F.E. Exam).
 6. Periodically provide writing samples as part of the Department's writing assessment program.

• CIVIL ENGINEERING (CIP = 14.0801)

Four-Year Curriculum - Civil Engineering

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

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

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

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

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
MAC 2282
MAC 2283
MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
MAC 2312/MAC 2282 (4)
MAC 2313/MAC 2283 (4)
MAP 2302/ MAP X305(3)

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L
or CHS 2440/CHS 2440L
CHM 2046/CHM 2046L
PHY 2048/PHY 2048L
PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C
or CHS X440/CHM 045L (4)
CHM X046/L or CHM 046C
PHY X048C or PHY X043/X048L (4)
PHY X049C or PHY X044//PHY X049L (4)

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

Civil and Environmental Engineering Admissions Requirements

Students entering the Civil & Environmental Engineering department must have completed the equivalent USF Engineering Calculus sequence, one year equivalent USF General Physics and one semester equivalent USF General Chemistry with a minimum of 2.3 GPA; and must have an overall and USF GPA of 2.0 or better.

Continuation Requirements

Continuation in the Civil & Environmental Engineering program requires a minimum grade of C- as well as a 2.5 GPA (based on best attempt) over the following courses:

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

Civil Engineering (ECE), BSCE, 131

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

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CHS	2440	Chemistry for Engineers	3
CHS	2440L	Chemistry for Engineers Laboratory	1
EGN	3000	Foundations of Engineering	1
ENC	1101	Composition I	3
MAC	2281	Engineering Calculus I	4
XXX	XXXX	FKL Social & Behavioral Sciences Elective	<u>3</u>
	Total		15

Spring Semester - Year 1

GLY	3850	Geology for Engineers	3
EGS	1113	Introduction to Design Graphics	3
ENC	1102	Composition II	3
MAC	2282	Engineering Calculus II	4
PHY	2048	General Physics I	3
PHY	2048L	General Physics I Laboratory	<u>1</u>
	Total		17

Fall Semester - Year 2

EGN	3311	Statics	3
XXX	XXXX	FKL Humanities Elective	3
MAC	2283	Engineering Calculus III	4
PHY	2049	General Physics II	3
PHY	2049L	General Physics II Laboratory	1
EGN	4427	Numerical and Computer Tools I	<u>3</u>
	Total		17

Spring Semester - Year 2

EGN	3321	Dynamics	3
EGN	3365	Materials	3
EGN	3331	Mechanics of Materials	3
EGN	3331L	Mechanics of Materials/ Materials Lab	1
EGN	3353	Basic Fluid Mechanics	3
MAP	2302	Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems (Note: EGN 3433 is not a 6A course)	<u>3</u>
	Total		16

Summer Term - Year 2

EGN	3615	Engineering Economics with Social and Global Implications	3
ENC	3246	Communications for Engineers (WI)	3
XXX	XXXX	FKL Human Cultural Diversity and Global Context	<u>3</u>
	Total		9

Fall Semester - Year 3

EGN	4454	Numerical and Computer Tools II	3
EGN	3343	Thermodynamics	3
EGN	3443	Probability and Statistics for Engineers	3
ENV	4001	Environmental Systems Engineering	3
TTE	4004	Transportation Engineering I	<u>3</u>
	Total		15

Spring Semester - Year 3

CES	3102	Structures I	3
CWR	4202	Hydraulics	3
EGN	3373	Introduction to Electrical Systems I	3
ENV	4004L	Environmental/Hydraulics Engineering Lab	1
XXX	XXXX	Department Upper-Level Elective (CE Concentration Elective)	3
XXX	XXXX	FKL Humanities Elective	<u>3</u>
	Total		16

Fall Semester - Year 4

CEG	4011	Geotechnical Engineering I	3
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CEG	4011L	Geotechnical/Transportation Laboratory	1
XXX	XXXX	Department Upper-Level Elective (CE Concentration Elective)	3
XXX	XXXX	FKL Fine Arts Elective	3
XXX	XXXX	Department Upper-Level Elective (CE Concentration Elective)	<u>3</u>
	Total		13

Spring Semester - Year 4

XXX	XXXX	Exit CE Capstone Design Requirement	3
CGN	4122	Professional and Ethical Issues in Engineering	1
XXX	XXXX	FKL Social and Behavioral Sciences Elective	3
XXX	XXXX	Department Upper-Level Elective (CE Concentration Elective)	3
XXX	XXXX	Department Upper-Level Elective (CE Concentration Elective)	<u>3</u>
	Total		13

TOTAL CREDIT HOURS TO DEGREE **131**

Gordon Rule (6A) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and by selecting one technical or general education elective that is an approved 6A communication course or by completing an AA degree at a Florida College System institution.

Foundations of Learning and Knowledge Core Curriculum: The math and science courses required for this major fully meet the math and science requirements of the FKL core curriculum. Students in the College of Engineering are exempt from the "Life Science" requirement.

The writing intensive and capstone design exit requirements are fully met through ENC3246 and a Capstone Design Course.

Civil Engineering Concentration AND CAPSTONE DESIGN Requirements

Civil Engineering students take one of the 3 tracks next listed:

Structures/Materials/Geotechnical Track

CES	4702	Concepts of Concrete Design	3
CES	4605	Concepts of Steel Design	3
CGN	4851	Concrete Construction Materials	3
CEG	4012	Geotechnical Engineering II	
	or		
TTE	4005	Transportation Engineering II	3
XXX	XXXX	Technical Elective	3
CES	4750	Capstone Structures/Materials/Geotechnical Design	3

Geotechnical/Transportation Track

CGN	4851	Concrete Construction Materials	3
CEG	4012	Geotechnical Engineering II	3
TTE	4005	Transportation Engineering II	3
XXX	XXXX	Technical Elective	3
XXX	XXXX	Technical Elective	3
CEG	4850	Capstone Geotechnical/Transportation Design	3

Environmental/Water Resources Track

ENV	4417	Water Quality and Treatment	3
CWR	4540	Water Resources Engineering I	3
CEG	4012	Geotechnical Engineering II	
	or		
TTE	4005	Transportation Engineering II	3
XXX	XXXX	Technical Elective	3
XXX	XXXX	Technical Elective	3
CWR	4812	Capstone Water Resources/Environmental Design	3

The Program supports the following technical elective courses:

CCE	4031	Construction Management	3
CEG	4012	Geotechnical Engineering II	3
CES	4605	Concepts of Steel Design	3
CES	4702	Concepts of Concrete Design	3
CGN	4851	Concrete Construction Materials	3

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CGN	4933	Special Topics in Civil & Environmental Engineering **	3
CWR	4540	Water Resources Engineering I	3
ENV	4417	Water Quality and Treatment	3
SUR	2101	Engineering Land Survey	3
TTE	4005	Transportation Engineering II	3
TTE	4003	Transportation and Society	3

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

Civil and Environmental Engineering Faculty

Chairperson: M. Gunaratne; *Professors Emeriti:* M. W. Anderson, W. Carpenter, R.P. Carnahan, W. Echelberger, 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, D. Simkins, M. Trotz, D. Yeh, A. Zayed; *Assistant Professors:* Q. Lu, A. Pinjari, A. Tejada, Q. Zhang, Y. Zhang; *Instructor:* T. Davis, K. Nohra; M. Stokes; *Courtesy Faculty:* S.E. Polzin, A. Stuart.

Department of Computer Science and Engineering

Undergraduate Degrees Offered:

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

Graduate Degrees Offered:

Master of Science in Computer Science (M.S.C.S)
Master of Science in Computer Engineering (M.S.Cp.E.)
Doctor of Philosophy in Computer Science and Engineering (Ph.D.)

This Department offers coursework and study in all areas fundamental to Computer Science and Computer Engineering. Undergraduate degree programs within the Department lead to the Bachelor of Science in Computer Science or Bachelor of Science in Computer Engineering. 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. 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.

Graduates from the Department follow rewarding careers in software and hardware development in industry and in government agencies. In addition to providing the credentials necessary for a professional career, the undergraduate curriculum prepares students for graduate education towards an M.S. or Ph.D. within the Department or at other universities. The Department faculty members are very committed to including undergraduate students in research through the Research Experience for Undergraduates (REU) program.

The Department offers an accelerated B.S./M.S. program where highly motivated students can complete both a B.S. and M.S. degree in five years. This program allows students to take graduate courses in their senior year that count towards both their B.S. and M.S. degrees. The Department also offers a minor in Computer Science, which provides a solid core of computing skills for students from other majors. The minor comprises 18 to 21 hours of course work within the Departmental core courses and advanced electives. The minor is intended for students who are interested in learning the fundamentals of Computer Science to enhance their major. The minor will also be of interest to those students intending to pursue a graduate degree where computing is essential background knowledge.

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 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.

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Objectives

The Department of Computer Science and Engineering has established the following objectives for graduates of the Department. Since the Department offers two degree programs, the objectives are defined for each program.

Computer Science Program Educational Objectives:

1. Our graduates will apply their knowledge and skills to succeed in a computer science 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 the basic principles and practices of computing grounded in mathematics and science to successfully complete software related engineering projects to meet customer business objectives and/or productively engage in research.
5. Our graduates will apply the basic computing principles and the knowledge of major areas of application of those fundamentals to the benefit of society.

Computer Engineering Program Educational Objectives:

1. Our graduates will apply their knowledge and skills to succeed in a computer engineering 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 the 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.
5. Our graduates will apply the basic principles and practices of engineering in the computing domain to the benefit of society.

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:
 - a. The minimum grade in specialization courses is a "C-", except as stated in Department admission requirements.
 - b. 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.

• COMPUTER SCIENCE (BCS) (CIP = 11.0101)

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

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

Students should complete the following **prerequisite courses** listed below at the lower level prior to entering the University. If these courses are not taken at a Florida College System institution, they must be completed before the degree is granted. Unless stated otherwise, a grade of "C" is the minimum acceptable grade ("C-" is insufficient).

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

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

COP XXXX*	3
MAC X311	4
MAC X312	4
PHY X048/X048L	4
or	
PHY X048C	4
PHY X049/X049L	4
or	
PHY X049C	4

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*Introductory Programming in C, C++, Java, or equivalent language.

Natural Sciences:

XXX XXXX** 6

**Two (2) science courses for science majors.

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

Computer Science Admissions Requirements

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 an overall grade point average of 3.00 or higher in these courses (best attempt) to be admitted to the Department of Computer Science and Engineering. 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.

Computer Science (BCS), BSCS, 120

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

EGN 3000	Foundations of Engineering	1
ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
XXX XXXX	Natural Sciences Elective	3
XXX XXXX	FKL Social and Behavioral Sciences Elective	3
Total		14

Spring Semester - Year 1

COP 2510	Programming Concepts	3
ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Laboratory	1
Total		14

Fall Semester - Year 2

COP 3514	Program Design	3
MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Laboratory	1
XXX XXXX	FKL Social and Behavioral Sciences Elective	3
Total		14

Spring Semester - Year 2

CDA 3103	Computer Organization	3
COP 3331	Object-Oriented Software Design	3
COT 3100	Introduction to Discrete Structures	3
XXX XXXX	FKL Humanities Elective	3
Total		12

Summer Term - Year 2

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

Fall Semester - Year 3

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CDA	4205	Computer Architecture	3
COT	4400	Analysis of Algorithms	3
EGN	3443	Probability and Statistics for Engineers	3
XXX	XXXX	Department Upper-Level Elective (CSE Software Elective)	3
XXX	XXXX	Natural Sciences Elective	<u>3</u>
Total			15

Spring Semester - Year 3

ENC	3246	Communication for Engineers (WI)	3
COP	4600	Operating Systems	3
XXX	XXXX	Department Upper-Level Elective (CSE Theory Elective)	3
XXX	XXXX	Department Upper-Level Elective (CSE Software Elective)	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	<u>3</u>
Total			15

Fall Semester - Year 4

XXX	XXXX	FKL Human Cultural Diversity and Global Context Elective	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	3
XXX	XXXX	Humanities Elective	3
XXX	XXXX	FKL Fine Arts Elective	<u>3</u>
Total			15

Spring Semester - Year 4

CIS	4250	Ethical Issues and Professional Conduct	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	3
XXX	XXXX	Elective (Upper-Level Humanities, Social Science or Fine Arts Elective)	<u>3</u>
Total			12

TOTAL CREDIT HOURS TO DEGREE

120

Gordon Rule (6A) is fully met through the mathematics courses above, ENC1101, ENC1102, ENC3246 and CIS4250 or by completing an A.A. degree at a Florida College System institution. The writing intensive and capstone design exit requirements are fully met through ENC3246 and CIS4250.

Foundations of Learning and Knowledge Core Curriculum: The math and science courses required for this major fully meet the math and science requirements of the FKL core curriculum. Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course.

COMPUTER ENGINEERING (ECP) (CIP = 14.0901)

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

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

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

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

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

Mathematics:

Courses at USF

MAC 2281
 MAC 2282
 MAC 2283
 MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
 MAC 2312/MAC 2282 (4)
 MAC 2313/MAC 2283 (4)
 MAP 2302/ MAP X305(3)

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Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L
 CHM 2046/CHM 2046L
 PHY 2048/PHY 2048L
 PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C or CHS X440/CHM 045L (4)
 CHM X046/L or CHM 046C
 PHY X048C or PHY X043/X048L (4)
 PHY X049C or PHY X044//PHY X049L (4)

Other:

COP XXXX*

COP XXXX*

*Intro Programming in C, C++, JAVA, or equivalent language.

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

Computer Engineering Admissions Requirements

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 an overall grade point average of 3.00 or higher in these courses (best attempt) to be admitted to the Department of Computer Science and Engineering. 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.

Computer Engineering (ECP), BSCP, 128

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Laboratory	1
EGN 3000	Foundations of Engineering	1
ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
XXX XXXX	FKL Social and Behavioral Sciences Elective	<u>3</u>
Total		15

Spring Semester - Year 1

COP 2510	Programming Concepts	3
ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Laboratory	<u>1</u>
Total		14

Fall Semester - Year 2

COP 3514	Program Design	3
MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Laboratory	1
XXX XXXX	FKL Social and Behavioral Sciences Elective	<u>3</u>
Total		14

Spring Semester - Year 2

CDA 3103	Computer Organization	3
COP 3331	Object-Oriented Design	3
COT 3100	Introduction to Discrete Structures	3
MAP 2302	Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems	3
XXX XXXX	FKL Humanities Elective	<u>3</u>
Total		15

Summer Term - Year 2

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

Fall Semester - Year 3

CDA	4205	Computer Architecture	3
COT	4400	Analysis of Algorithms	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	3
EEE	3394	Electronic Materials	3
EGN	3373	Introduction to Electrical Systems I	<u>3</u>
Total			15

Spring Semester - Year 3

CDA	4203	Computer System Design	3
CDA	4203L	Computer System Design Lab	1
COP	4600	Operating Systems	3
EGN	3615	Engineering Economics with Social and Global Implications	3
XXX	XXXX	Department Upper-Level Elective (CSE Hardware Elective)	3
XXX	XXXX	Natural Sciences Elective	<u>3</u>
Total			16

Fall Semester - Year 4

CDA	4213	CMOS-VLSI Design	3
CDA	4213L	CMOS-VLSI Design Lab	1
EGN	3443	Probability and Statistics for Engineers	3
ENC	3246	Communication for Engineers (WI)	3
XXX	XXXX	Department Upper-Level Elective (CSE Elective)	3
XXX	XXXX	FKL Fine Arts Elective	<u>3</u>
Total			16

Spring Semester - Year 4

CIS	4250	Ethical Issues and Professional Conduct	3
CIS	4910	Computer Science Project	2
XXX	XXXX	FKL Human Cultural Diversity and Global Context	3
XXX	XXXX	Department Upper-Level Elective (CSE Hardware Elective)	3
XXX	XXXX	FKL Humanities Elective	<u>3</u>
Total			14

TOTAL CREDIT HOURS TO DEGREE **128**

Gordon Rule (6A) is fully met through the mathematics courses above, ENC1101, ENC1102, ENC3246 and CIS4250 or by completing an A.A. degree at a Florida College System institution. The writing intensive and capstone design exit requirements are fully met through ENC3246 and CIS4250.

Foundations of Learning and Knowledge Core Curriculum: The math and science courses required for this major fully meet the math and science requirements of the FKL core curriculum. Students in the College of Engineering may substitute a second "Physical Science" course for the required "Life Science" course.

Computer Science Minor

This Computer Science minor is an 18 credit hour program that is open to all students, except for Department majors, that meet the prerequisites listed below. 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). 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. Calculus I and II (MAC 2281 and MAC 2282 are recommended)

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2. Physics I and II with lab (PHY 2048/2048L and PHY 2049/2049L are recommended)
3. Programming Concepts COP 2510 or other approved introductory programming course

Required Courses (12 hours)

COP 3514	Program Design	3
CDA 3103	Computer Organization	3
COP 3331	Object Oriented Design	3
COP 4530	Data Structures	3

The remaining six credit hours can be taken from electives offered by the Department. 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	3
COP 4600	Operating Systems	3
CDA 4205	Computer Architecture	3

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

Computer Science and Engineering Faculty

Chairperson: L. Hall; *Distinguished Professors:* L. Hall, A. Kandel, N. Ranganathan; *Professors:* K. Christensen, D. Goldgof, R. Kasturi, R. Perez, L. Piegler, S. Sarkar; *Associate Professors:* A. Iamnitchi, S. Katkooi, M. Labrador, D. Rundus; H. Zheng *Assistant Professors:* J. Ligatti, L. Palmer, X. Qian, Y. Sun, Y. Tu; *Instructors:* H. Jeanty, R. Tindell, J. Wang; *Professors Emeritus:* H. Glass, M. Varanasi.

Department of Electrical Engineering

Undergraduate Degree Offered:

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

Graduate Degrees Offered:

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

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

Doctor of Philosophy in Electrical Engineering (Ph.D.)

Doctor of Philosophy in Engineering Science (Ph.D.)

This department 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, 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, 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 to undergraduate and graduate students.

Mission Statement

The mission of the Electrical Engineering Department at the University of South Florida is to provide internationally recognized educational programs; to conduct and disseminate internationally recognized research benefiting humanity; to provide service to society; and to emphasize the need for lifelong learning, ethical conduct and an understanding of the diverse social context in which engineering is practiced.

Objectives

The Department objectives are to produce graduates:

1. with the knowledge and skills necessary to practice Electrical Engineering successfully.
2. who can pursue advanced topics through graduate or professional studies.

Students pursuing the Bachelor of Science in the Electrical Engineering program take designated coursework in network analysis, electronics, communications, electromagnetic theory, control systems, microelectronics and microprocessors. This coursework is supplemented by electives in many specialized areas of electrical engineering.

Students completing this program normally pursue industrial careers in electronics, communications, power and controls, digital systems, microelectronics, and information systems. The electrical graduate may apply his/her knowledge to such diverse areas as wireless and satellite communications, remote guidance, MEMS, sensing technology, systems integration, automation, computer and information systems, electronic power generation and transmission, electrically propelled transportation, etc. The graduate may do this by performing needed engineering functions related to research and development (often requires an advanced degree), design, production, operation, sales, or management of these products/services.

Departmental Policies

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

1. Mandatory academic advising of students for each term.
2. Exit interviews as a graduation requirement.
3. Students must pass all required BSEE courses, except MAP 2302, EGN 3373 and EGN 3374, with a grade of "C" or better. MAP 2302, EGN 3373 and EGN 3374 must be passed with a grade of B or better to continue in the program.

The Electrical Engineering Honors Program

I. Admissions Criteria:

- a. Junior status – An invitation to apply will be sent to eligible students at the start of their junior year by the Department of Electrical Engineering and application can be made at that time with decisions made at the end of the first semester, junior year;
- b. Completion of the core courses required for the Electrical Engineering major with a GPA of at least 3.5 through the completion of the first semester, junior year;
- c. An overall GPA of at least 3.5 through the completion of the first semester, junior year.
- d. Recommendation of a committee consisting of Electrical Engineering faculty members and engineering leaders from industry, based upon an application, letters of recommendation, statement of interest, and an interview.

II. Requirements for Completion of Departmental Honors:

- a. Completion of requirements for a major in Electrical Engineering with a GPA of at least 3.5 for core courses and an overall GPA of at least 3.5;
- b. Selection of two (2) Technical Electives in conjunction with a program advisor. One of the courses should be a 4000 level Sustainable Engineering/Green Engineering course and the other should be a course at the 5000/6000 level;
- c. Nine (9) additional credits (the EE Honors courses) beyond the degree requirements, which include a 4000 level Leadership Forum, 4000 level Internship/Study Abroad/ Enrichment Experience, and 5000 level Honors Thesis. These courses are described in the sequel.

III. Continuation Requirements:

- a. Electrical Engineering Leadership Honors Program students failing to complete the EE Honors courses with a grade of "B" or better will not be eligible to continue in the program and will be notified by the Department of Electrical Engineering of their dismissal from the program.
- b. Electrical Engineering Leadership Honors Program students must complete and defend their Honors thesis in the second semester of their senior year. Students who do not complete this requirement may, upon the recommendation of their Honors thesis supervisor and the Department of Electrical Engineering, be allowed to continue in the program until the final semester prior to their graduation. Under no circumstances shall the extension be for more than one academic year.

• ELECTRICAL ENGINEERING (EEL) (CIP = 14.1001)

Four-Year Curriculum in Electrical Engineering

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

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

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

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

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

Mathematics:

Courses at USF

MAC 2281
MAC 2282
MAC 2283
MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
MAC 2312/MAC 2282 (4)
MAC 2313/MAC 2283 (4)
MAP 2302/ MAP X305(3)

Natural Sciences:

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Courses at USF

CHM 2045/CHM 2045L
PHY 2048/PHY 2048L
PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C or CHS X440/CHM X045L* (4)
PHY X048C or PHY X043/X048L (4)
PHY X049C or PHY X044/PHY X049L (4)

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

Electrical Engineering Admissions Requirements

Admission to the EE Department requires completion of Engineering Calculus I, II & III; Calculus-based Physics I & II (with labs); and Chemistry I (with lab) with a 3.00 overall grade point average in these courses (best attempt) and a minimum grade of "C" in each course. Continuation in the major requires successful completion of EGN 3373, EGN 3374, and Differential Equations with grades of B or higher (best attempt).

Electrical Engineering (EEL), BSEE, 128

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
XXX XXXX	FKL Humanities Elective	3
XXX XXXX	FKL Fine Arts Elective	3
XXX XXXX	FKL Social and Behavioral Sciences Elective	<u>3</u>
Total		16

Spring Semester - Year 1

CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Laboratory	1
EGN 3000	Foundations of Engineering	1
ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Laboratory	<u>1</u>
Total		16

Fall Semester - Year 2

EGN 3443	Probability and Statistics for Engineers	3
EGN 3615	Engineering Economics with Social and Global Implications	3
MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Laboratory	<u>1</u>
Total		14

Spring Semester - Year 2

EEE 3394	Electronic Materials	3
EEL 2161	EE Computer Methods	3
EGN 3373	Introduction to Electrical Systems I	3
EGN 3420	Engineering Analysis	3
MAP 2302	Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems (Note: EGN 3433 is not a 6A course)	<u>3</u>
Total		15

Summer Term - Year 2

EGN 3374	Electrical Systems II	3
ENC 3246	Communication for Engineers	3
XXX XXXX	FKL Humanities Elective	<u>3</u>
Total		9

Fall Semester - Year 3

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EEE 4351C	Semiconductor Devices	3
EEL 3100	Network Analysis	3
EEL 3115L	Laboratory I	1
EEL 4471	Electromagnetics	3
EEL 4705	Logic Design	3
EEL 4705L	Logic Laboratory	1
Total		14

Spring Semester - Year 3

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

Fall Semester - Year 4

EEE 4301	Electronics II	3
EEL 3116L	Laboratory II	1
EEL 4512C	Introduction to Communication Systems	3
EEL 4657	Linear Control Systems	3
EEL 4657L	Linear Controls Laboratory	1
EEL 4906	Engineering Design/Professionalism	3
Total		14

Spring Semester - Year 4

EEL 4914	Senior Project Design	3
XXX XXXX	FKL Human Cultural Diversity and Global Context	3
XXX XXXX	Department Upper-Level Elective	3
XXX XXXX	Department Upper-Level Elective	3
XXX XXXX	FKL Social and Behavioral Sciences Elective	3
Total		15

TOTAL CREDIT HOURS TO DEGREE

128

Gordon Rule (6A) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and by selecting one technical or general education elective that is an approved 6A communication course or by completing an AA degree at a Florida College System institution.

Foundations of Learning and Knowledge Core Curriculum: The math and science courses required for this major fully meet the math and science requirements of the FKL core curriculum. Students in the College of Engineering are exempt from the "Life Science" requirement.

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

Departmental Policy: For EE majors a minimum grade of B is required for EGN 3373, EGN 3374 and Differential Equations.

Electrical Engineering Faculty

Chairperson: T. M. Weller; *Professors:* L.P. Dunleavy, C. S. Ferekides, R. Gitlin, A.M. Hoff, V.K. Jain, W.A. Moreno, D.L. Morel, S. D. Morgera, R. S. Sadow, R. Sankar, E.K. Stefanakos; *Associate Professors:* H. Arslan, S. Bhanja, K.A. Buckle, R. Schlaf, P.H. Wiley; *Assistant Professors:* L. Fan, Z. Miao, G. Mumcu, A. Raji, A. Takshi, S.W. Thomas, J. Wang.

Department of Industrial & Management Engineering

Undergraduate Degree Offered:

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

Graduate Degrees Offered:

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

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

Master of Industrial Engineering (M.I.E.)

Doctor of Philosophy in Industrial Engineering (Ph.D.)

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This department offers study pertinent to the design, evaluation and operation of a variety of industrial systems, ranging from the analysis of public systems to the operation of manufacturing plants. Topics include production planning and control, production and plant design, applied statistics, operations research, human factors and productivity, manufacturing, and automation. The department has excellent laboratory facilities that support projects and research in collaboration with industry and in non-traditional manufacturing systems such as service, healthcare and transportation. Classroom learning is supported by laboratory experience in computer applications, computer-aided manufacturing, human performance, automation, and applications of robotics. The Accelerated Graduate Program (formerly called the 5 year program) in Engineering Management allows qualified students in any participating Engineering major to simultaneously enroll in graduate and undergraduate courses. Up to six credit hours of approved courses may be counted towards both the bachelor's and the master's degrees, reducing the total number of credit hours required to complete both degrees.

The Master of Science in Engineering Management is a multidisciplinary graduate degree program directed towards engineers who want to transition to technical management. Courses in the program involve concepts in engineering management, resource management, strategic planning, and productivity. The program offers evening and off-campus courses.

Mission Statement

The mission of the IMSE Department is to provide students with a high quality education which integrates the latest research and practices of the field into the curriculum, to pursue excellence in basic and applied research in the field of Industrial and Management Systems Engineering, and to provide service to the profession and to society.

Objectives

1. Our graduates will have comprehensive knowledge of industrial engineering and related scientific principles.
2. Our graduates will have the ability to think creatively, communicate effectively, and work productively in teams.
3. Our graduates will have an understanding of ethical and professional responsibilities of an industrial engineer.
4. Our graduates will be motivated to contribute to society in activities such as role models for the young, advisory positions for government or non-profit agencies, and as active members in professional organizations.
5. Our graduates will pursue life-long learning opportunities, such as short courses, seminars, professional conferences, certificate programs, and graduate studies.

Departmental Policies

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

1. Mandatory academic advising of students for each term.
2. An exit interview is a graduation requirement.
3. Minimum grade in degree required math, science, engineering and specialization courses is a "C" or better, "C-" is insufficient.

• INDUSTRIAL ENGINEERING (EIE) (CIP = 14.3501)

Four-Year Curriculum in Industrial and Management Systems Engineering

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

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

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

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

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

Mathematics:

Courses at USF

MAC 2281
MAC 2282
MAC 2283
MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
MAC 2312/MAC 2282 (4)
MAC 2313/MAC 2283 (4)
MAP 2302/ MAP X305(3)

Natural Sciences:

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Courses at USF

CHM 2045/CHM 2045L
PHY 2048/PHY 2048L
PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C or CHS X440/CHM X045L (4)
PHY X048C or PHY X043/X048L (4)
PHY X049C or PHY X044/PHY X049L (4)

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

Industrial Engineering Admissions Requirements

Transfer students must have completed the equivalent USF Engineering Calculus sequence with a 2.0 GPA; must have completed one year of equivalent USF General Physics and Chemistry courses with a minimum grade of C or better and a 2.0 GPA; must have a USF and overall GPA of 2.0 or better.

Industrial Engineering (EIE), BSIE, 128

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Laboratory	1
EGN 3000	Foundations of Engineering	1
ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
XXX XXXX	FKL Social and Behavioral Sciences Elective	<u>3</u>
Total		15

Spring Semester - Year 1

CHM 2046	General Chemistry II	3
ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Laboratory	1
XXX XXXX	FKL Humanities Elective	<u>3</u>
Total		17

Fall Semester - Year 2

EGN 3443	Probability & Statistics for Engineering	3
MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Laboratory	1
XXX XXXX	FKL Humanities Elective	<u>3</u>
Total		14

Spring Semester - Year 2

COP 2510	Programming Concepts (or COP 2270 Programming in C for Engineers)	3
EGN 3311	Statics	3
EGN 4450	Introduction to Linear Systems	2
MAP 2302	Differential Equations or EGN 3433 Modeling and Analysis of Engineering Systems (Note: EGN 3433 is not a 6A course)	3
XXX XXXX	FKL Fine Arts Elective	<u>3</u>
Total		14

Summer Term - Year 2

EGN 3615	Engineering Economics with Social and Global Implications	3
EGS 1113	Introduction to Design Graphics	3
XXX XXXX	FKL Human & Cultural Diversity in a Global Context Elective	<u>3</u>
Total		9

Fall Semester - Year 3

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EGN	3365	Materials Engineering I	3
EGN	3373	Introduction to Electrical Systems I	3
EIN	4312C	Work Analysis	3
EIN	4621	Manufacturing Processes	3
ESI	4312	Deterministic Operations Research	3
Total			15

Spring Semester - Year 3

EGN	3343	Thermodynamics I	3
EIN	4333	Production Control	3
ESI	4221	Industrial Statistics and Quality Control	3
ESI	4313	Probabilistic Operations Research	3
XXX	XXXX	College Upper-Level Elective (Engineering Science Technical Elective)	3
Total			15

Fall Semester - Year 4

EIN	4352	Engineering Cost Analysis	3
EIN	4364C	Facilities Design	3
ESI	4244	Design of Experiments	3
ESI	4523	Industrial Systems Simulation	3
XXX	XXXX	Department Upper-Level Elective (Industrial Engineering Technical Elective)	2
Total			14

Spring Semester - Year 4

EIN	4243C	Human Factors	3
EIN	4601C	Automation and Robotics	3
EIN	4891	Capstone Design	3
ENC	3246	Communication for Engineers (WI)	3
XXX	XXXX	Department Upper-Level Elective (Industrial Engineering Technical Elective)	3
Total			15

TOTAL CREDIT HOURS TO DEGREE **128**

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 Learning and Knowledge Core Curriculum: The math and science courses required for this major fully meet the math and science requirements of the FKL core curriculum. Students in the College of Engineering are exempt from the "Life Science" requirement.

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

Industrial and Management Systems Faculty

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

Department of Mechanical Engineering

Undergraduate Degree Offered:

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

Graduate Degrees Offered:

- Master of Mechanical Engineering (M.M.E.)
- Master of Science in Mechanical Engineering (M.S.M.E.)*
- Master of Engineering (M.E.)
- Master of Science in Engineering (M.S.E.)
- Doctor of Philosophy in Mechanical Engineering (Ph.D.)
- Doctor of Philosophy in Engineering Science (Ph.D.)

*The Department offers a combined B.S./M.S. five year degree program.

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

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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; electronic utilities and 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 Mechanical Engineering Department is:

- a. to provide an exemplary undergraduate and graduate education for students entering the mechanical engineering profession or seeking careers in related fields;
- b. to advance scientific knowledge through basic and applied research;
- c. to disseminate technical information through scholarly publication and presentation, and continuing education;
- d. to advance the profession through service within the associated societies;
- e. to promote activities which embrace global development.

Objectives

The objectives of the Undergraduate Program in Mechanical Engineering are:

- a. Our graduates will successfully apply concepts of science, mathematics, computation, and engineering in their chosen endeavor;
- b. Our graduates will possess knowledge and skills essential to engineering processes, such as design, analysis, synthesis, fabrication and experimental techniques;
- c. Our graduates will demonstrate skills for professional interaction and leadership including multi-disciplinary collaboration, and effective oral and written communication.
- d. Our graduates will understand technology within a global, societal and economic context. They will also demonstrate continued career development as well as professional and ethical responsibility.

Departmental Policies

The Department has the following policies:

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

Admissions Requirements

Students entering the Mechanical Engineering department must have completed the equivalent USF Engineering Calculus sequence, one year equivalent USF General Physics and one semester equivalent USF General Chemistry with a minimum grade of C in each course and a 2.5 GPA based upon all attempts (grade forgiveness is honored in this calculation).

• MECHANICAL ENGINEERING (EME) (CIP = 14.1901)

Four-Year Curriculum in Mechanical Engineering

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Florida College System Institution

If a student wishes to transfer without an A.A. degree and has fewer than 60 semester hours of acceptable credit, the student must meet the university's entering freshman requirements including ACT or SAT test scores, GPA, and course requirements. Students should complete the **prerequisite courses** listed below at the lower level prior to entering the University. If these courses are not taken at a Florida College System institution, they must be completed before admission into the department is granted. A grade of "C" is the minimum acceptable grade in prerequisite courses.

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

Some courses required for the major may also meet General Education Requirements.

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Mathematics:

Courses at USF

MAC 2281
MAC 2282
MAC 2283
MAP 2302

Courses at a Florida College System Institution

MAC 2311/MAC 2281 (4)
MAC 2312/MAC 2282 (4)
MAC 2313/MAC 2283 (4)
MAP 2302/ MAP X305(3)

Natural Sciences:

Courses at USF

CHM 2045/CHM 2045L
PHY 2048/PHY 2048L
PHY 2049/PHY 2049L

Courses at a Florida College System Institution

CHM X045/L or CHM X045C or CHS X440/CHM X045L* (4)
PHY X048C or PHY X043/X048L (4)
PHY X049C or PHY X044/PHY X049L (4)

*or CHS X440 if 4 credits with included laboratory

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

Students qualify for direct entry to the department if they have completed thesis courses at a Community College 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.

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

Grade Requirements

Students in the Mechanical Engineering Department must have and maintain a minimum 2.0 GPA in EGN engineering and EML specialization courses, as well as a minimum overall and USF GPA of 2.0. A grade of "C-" is the minimum acceptable grade for EGN and EML courses which are prerequisites to other EGN and EML courses.

Curriculum for BSME, (128 credit hours)

The schedule that follows indicates the required courses for this degree program and the recommended sequence of registration for full time engineering students. Students who adhere to the recommended sequence of courses, and complete each course with the required grade, will be fully prepared for each subsequent semester. Registration assistance will be provided by academic advisors in the College of Engineering.

Fall Semester - Year 1

CHS 2440	Chemistry for Engineers	3
CHS 2440L	Chemistry for Engineers Laboratory	1
EGN 3000	Foundations of Engineering	1
ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
XXX XXXX	FKL Humanities Elective	<u>3</u>
Total		15

Spring Semester - Year 1

ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Laboratory	1
XXX XXXX	FKL Fine Arts Elective	<u>3</u>
Total		14

Fall Semester - Year 2

EGN 3311	Statics	3
XXX XXXX	FKL Social and Behavioral Sciences Elective	3
MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Laboratory	<u>1</u>
Total		14

Spring Semester - Year 2

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EGN 3321	Dynamics	3
EGN 3365	Materials Engineering I	3
EGN 3373	Introduction to Electrical Systems I	3
EML 3035	Programming Concepts for Mechanical Engineers	1
MAP 2302	Differential Equations	3
XXX XXXX	FKL Social and Behavioral Sciences Elective	<u>3</u>
Total		16

Summer Term - Year 2

EGN 3343	Thermodynamics I	3
EGN 3443	Engineering Statistics I	3
EML 3500	Mechanics of Solids	3
EML 3022	Computer Aided Engineering (CAD)	<u>3</u>
Total		12

Fall Semester - Year 3

EML 3041	Computational Methods	3
EML 3262	Kinematics and Dynamics of Machinery	3
EML 3701	Fluid Systems	3
EML 4325	Mechanical Manufacturing Processes	3
ENC 3246	Communication for Engineers	<u>3</u>
Total		15

Spring Semester - Year 3

EML 3303	Mechanical Engineering Lab I	3
EML 4123	Heat Transfer	3
EML 4501	Machine Design	3
XXX XXXX	FKL Human & Cultural Diversity in a Global Context Elective	3
XXX XXXX	Department Upper-Level Elective (Technical Design Elective)	<u>3</u>
Total		15

Fall Semester - Year 4

EML 4106C	Thermal Systems and Economics	3
EML 4220	Vibrations	3
EML 4302	Mechanical Engineering Laboratory II	3
XXX XXXX	Department Upper-Level Elective (Technical Design Elective)	3
XXX XXXX	FKL Humanities Elective	<u>3</u>
Total		15

Spring Semester - Year 4

EML 4312	Mechanical Controls	3
EML 4551	Capstone Design	3
XXX XXXX	Department Upper-Level Elective (Technical Design Elective)	3
XXX XXXX	Department Upper-Level Elective (Technical Design Elective)	<u>3</u>
Total		12

TOTAL CREDIT HOURS FOR BSME

128

Gordon Rule (6A) is fully met through the mathematics courses above, ENC 1101, ENC 1102, ENC 3246 and by selecting one general education elective that is an approved 6A communication course or by completing an AA degree at a Florida College System institution.

The math and science courses required for this major fully meet the math and science requirements of the Foundations of Learning and Knowledge core curriculum. Students in the College of Engineering are exempt from the "Life Science" requirement.

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

Mechanical Engineering Faculty

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