COLLEGE OF ENGINEERING

MISSION STATEMENT

The mission of the USF College of Engineering is to continuously aspire to excellence in teaching, research and public service. The College values academic excellence, professionalism, ethics and cultural diversity among its students, staff and faculty. The College is committed to addressing the needs of its constituencies and gives careful consideration to the urban and suburban populations in our service area.

At the undergraduate level the College is committed to provide students with a strong, broad-based, fundamental engineering education as preparation for careers in industry in a global environment, 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.

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

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

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The College of Engineering offers undergraduate and graduate programs to prepare students for a broad spectrum of professional careers in engineering. Laboratory experience as well as real-world participation in technological problem-solving is a key aspect of a professional engineer's college education. The College of Engineering, in implementing this need, augments its own modern laboratory and research facilities by close contact with the professional societies and the many industries in the metropolitan Tampa Bay area.

Students in engineering choose from a variety of quality majors depending upon individual interests and career objectives. 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. Students who are interested in advanced design or research should pursue the 5-Year Program leading to a Master of Science in Engineering degree. The Accreditation Board for Engineering and Technology, Inc. (ABET) has inspected and accredited the programs of the College of Engineering defined by the Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, Industrial Engineering and Mechanical Engineering. The Bachelor of Science program in Computer Science is accredited by the Computer Science Accreditation Commission (CSAC) of the Computing Sciences Accreditation Board (CSAB).

See "Departments and Programs" in this section for descriptions of engineering fields and degrees offered by the college. The "Four Year Programs" section includes suggested courses students need to take, beginning with their first semester at USF.

Students interested in particular programs offered by the College of Engineering should direct their inquiries to the College of Engineering Office of Advising (see Advising section below). Information is also available on the College's website: http://www.eng.usf.edu/.

PROFESSIONAL ENGINEERING

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 of 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 portion, designed to equip the prospective engineer with a broad base of fundamental technical knowledge. To this foundation is added the student's specialization of sufficient depth to prepare him/her to successfully embark on a professional career.

The Bachelor of Science degrees offered in various engineering fields provide the student a broad education with sufficient technical background to contribute effectively in many phases of engineering not requiring the depth of knowledge needed for advanced design or research. However, while the baccalaureate degree is considered the minimum educational experience for participating in the Engineering profession, and as such is the first professional degree, students interested in design and research are strongly encouraged to pursue advanced work beyond the baccalaureate either at this or other institutions. It is becoming increasingly evident that large segments of today's engineering professionals are involved in some form of post baccalaureate study. Engineers are earning advanced degrees to obtain the information and training necessary to meet effectively tomorrow's technological challenges. All are faced with the continuing problem of refurbishing and updating their information skills and most are obtaining advanced information by means of formal graduate study, seminars, special institutes and other such systems designed for this purpose. *Life-long learning is a fact in engineering practice, and graduates must be aware and prepared to follow it.*

The Bachelor of Science degree program in a designated engineering field and the Master of Science degree in the same field may be pursued simultaneously in a program called the 5-Year Program. The 5-Year Program requires 30 semester hours of graduate work in addition to that of the Bachelor of Science degree.

Preparation for Engineering

Students planning to attend USF's College of Engineering should familiarize themselves thoroughly with the College's admissions standards and requirements, which are more stringent than the University's minimum entrance requirements.

The high school student anticipating a career in engineering should elect the strongest academic program that is available while in high school, including four years each of English, mathematics and science (preferably including Chemistry and Physics), as well as full programs in the social sciences and humanities.

Prospective students considering engineering at the University of South Florida who lack certain preparation in high school must elect to follow a program to overcome their deficiencies. One alternative for these students, classified as "Pre-Engineering majors" might include preparatory coursework. The University of South Florida generally offers most required pre-engineering courses every semester. As another alternative, students may wish to avail themselves of the State's system of junior/community colleges which offer a wide range of preliminary coursework; many of these schools also offer full programs in pre-engineering (first two years' coursework).

Junior/community college students planning to transfer to the University of South Florida's engineering program at the junior level from a State of Florida operated college or university should follow a pre-engineering program leading to an A.A. degree. All transfer students should complete as much of the

mathematics and science coursework as is available to them. Transfer students should be aware that the College expects them to meet its admission requirements listed in this section under college regulations for graduation just as it expects its own students to meet these requirements. Junior/community college transfer students should note that in addition to freshman and sophomore level courses, required junior level courses are given each semester thus permitting full continuity in studies for the student. Junior/community college students intending to pursue an engineering program at USF should contact the advisor at their institution and request a course equivalency list.

The College of Engineering can assist students who are planning to obtain an Engineering degree from the University of South Florida and who have started their studies elsewhere in formulating a sound total program. Interested students should contact the College's Advising Office (813/974-2684) furnishing sufficient details to permit meaningful response.

STUDENT COMPUTER POLICY

Although it is not mandatory, the College strongly recommends acquisition of either a desktop or a laptop personal computer. Recommended computer configuration for a student to be able to run engineering applications is indicated on the College web page http://www.eng.usf.edu. For further details, contact the Associate Dean of Engineering or the Director of Engineering Computing in the College. Also see the section on "College Computing Facilities."

Undergraduate Admission to the College of Engineering

Before declaring a particular major within the field of engineering, students must meet two sets of admission requirements: one for the College of Engineering and the other for the student's chosen degree program (see "College of Engineering Admission Requirements" and "Admission Requirements for Programs in Engineering" below). Students may apply to the College of Engineering upon initial entry to the University by declaring Engineering as their intended major on their admissions application. When a student is accepted to USF, engineering staff will review the necessary credentials and notify the applicant of his or her Engineering status.

USF students may apply through the Advising Office, in the College of Engineering. To be considered for admission to the College, an applicant must be accepted by the University as a degree-seeking student and be academically in good standing.

Applicants whose native language is other than English must submit TOEFL scores to the College of Engineering. The minimum TOEFL score must be 550.

COLLEGE OF ENGINEERING ADMISSION REQUIREMENTS

1. Freshmen:
   a. Test Scores:
      SAT—combined score of 1050 minimum with a minimum quantitative of 550.
      ACT—combined score of 25 minimum and mathematics of 25 minimum.
   b. High School Mathematics: Should include sufficient algebra and trigonometry to enter Engineering Calculus I.
   c. High School Grade Point Average of 2.5/4.0.
2. Transfer Students:
   a. Engineering
      Florida community college transfer students that have completed the courses shown below with a minimum grade of "C" are accepted directly into the College of Engineering.
      Communications:
         ENC 1101/1102 English I and II (6)
      Mathematics:
         MAC 2311 Engineering Calculus I (4)
            or MAC 2281, MAC 2282, MAC 2283
         MAC 2312 Engineering Calculus II (4)
            or MAC 2281, MAC 2282, MAC 2283
         MAC X283 Engineering Calculus III (4)
            or MAC 2281, MAC 2282, MAC 2283
         MAP X302 Differential Equations (3)
      Natural Sciences:
         CHM X045/X045L General Chemistry I (with lab) (4)
            or CHS 1440 Chemistry for Engineers
         PHY X048/X048L General Physics and Laboratory I (4)
         PHY X049/X049L General Physics and Laboratory II (4)
      Humanities & Social Sciences:
         Humanities Courses (6)
         Social Science Courses (6)
         Humanities or Social Sciences (3)
   b. Computer Science
      Transfer students into the Computer Science program from a Florida community college are not required to have Differential Equations, MAP X302, or any of the Chemistry courses indicated above.
   c. Information Systems
      Transfer students into the Information Systems program from a Florida community college are not required to have Calculus III, Differential Equations, MAP X302, or any of the Chemistry courses indicated above.

All other transfer students should contact the College's Admission Office (813/974-2684).

REQUIRED PREREQUISITES FOR ENTERING ENGINEERING PROGRAMS

Once a student has been admitted to the College of Engineering, he/she must then seek admission into one of the specific departments.

The minimum requirements for acceptance by the departments administering the Engineering programs in Chemical, Civil, Electrical, Industrial and Mechanical Engineering are completion of English, Calculus, Differential Equations, Physics and Chemistry requirements.

The minimum requirements for admission to the Computer Engineering, Computer Science, and Information Systems programs offered by the Computer Science and Engineering Department are completion of English I & II , Physics I & II (and labs) and Calculus I & II with a grade point average of 3.0 or higher in those eight courses. Following departmental admission, it is necessary that a student complete the courses CDA 3100 (Computer Organization) , and COP 3514 (Program Design) with a grade point average for all attempts of at least 3.0 prior to taking any other departmental courses.

Prior to being admitted to a department, a student may be permitted to take no more than two departmental engineering courses. Individual departments may have continuation requirements.

A student can have his or her academic records housed in a department and be advised by the department advisor prior to completing requirements for department admission if he or she so chooses. This type of student must still comply with all of the above-listed requirements prior to official acceptance by 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 freshmen year.

New students must attend the University's Orientation program. They are assigned an engineering advisor during this program and receive advisement for their first semester at that time.

The student and advisor jointly work out a plan of study that meets both the student's career objectives and the College of

Engineering's degree requirements. The advisors maintain the College of Engineering student's records.

Students not yet meeting departmental admissions requirements may elect to be advised by the general engineering advising office or the department of their intended specialization.

While the College provides advising services to assist students with academic planning, *the responsibility for seeing that all graduation requirements are met rests with the students.*

The College of Engineering requires all undergraduates to apply for graduation the semester prior to the anticipated graduation term. Necessary forms and instructions can be obtained in the Engineering Advising Office.

Advising Offices

Tampa Campus: The College of Engineering is located near the south-central side of campus; the Engineering Advising Office is on the Northeast corner of the portables west of Engineering II in room ENX 100, (813) 974-2684.

Sarasota Campus: Palmer "C" Building (PMC), Room 101, (941) 359-4331/4330.

Lakeland Campus: Student Services Office (LLC), Room 2100, (800) USF-5636 (in state only), (863) 667-7071

Office Hours

Usual office hours are 8 a.m. - 5 p.m., Monday through Friday.

For off-time meeting hours, please call the College's advising office.

DEPARTMENTS AND PROGRAMS

The supervision of the academic programs for the College is the function of the six administrative departments together with several coordinators. Each department is responsible for specific professional programs, faculty, laboratories, and student advising.

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

This department offers coursework and study in all areas fundamental to Chemical Engineering. Topics included are thermodynamics, fluid flow, heat transfer, mass transfer, separation processes, reactors, instrumentation and process control, economics optimization, computational methods, computer aided design techniques, and process/plant design. These courses, together with mathematics, physics, chemistry, other interdisciplinary engineering fundamentals, English, 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 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, biotheology, and biomechanics.

CIVIL AND ENVIRONMENTAL ENGINEERING

Undergraduate Degree Offered:
Bachelor of Science in Civil Engineering (B.S.C.E.)
Graduate Degrees Offered:
Master of Science in Civil Engineering (M.S.C.E.)
Master or Science in Engineering (M.S.E.)
Master of Science in Environmental Engineering (M.S.E.V.)
Master of Civil Engineering (M.C.E.)
Master of Engineering (M.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 structural engineering, engineering mechanics, geotechnical engineering, transportation engineering, water resources engineering, materials and corrosion engineering, and environmental engineering.

Students completing the program may enter the profession as engineers in the civil, structural, geotechnical, transportation, water resources, environmental, hydraulics, or materials discipline. 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, in engineering consulting firms, or in 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.

COMPUTER SCIENCE AND ENGINEERING

Undergraduate Degrees Offered:
Bachelor of Science in Computer Engineering (B.S.Cp.E.)
Bachelor of Science in Computer Science (B.S.C.S)
Bachelor of Science in Information Systems (B.S.I.S)
Graduate Degrees Offered:
Master of Science in Computer Science (M.S.C.S)
Master of Science in Computer Engineering (M.S.C.E.)
Doctor of Philosophy in Computer Science and Engineering (Ph.D.)
Doctor of Philosophy in Engineering Science (Ph.D.)

This department offers coursework and study in all areas fundamental to Computer Science, Computer Engineering, and Information Systems. Topics dealt with are computer architecture and hardware design, software engineering, computer system organization, operating systems, algorithms and data structures, computer graphics, user interface, computer networks, database systems, robotics, theory of computation and artificial intelligence.

Our research areas of faculty concentration are 1) computer architecture and VLSI design/testing, 2) artificial intelligence and robotics, 3) graphics/image processing/computer vision, and 4) networks.

Computing facilities available to students in the Department include several microprocessor and design laboratories for hardware-oriented studies, personal computer laboratories for general use in programming assignments, and networked SUN workstations for use by majors. The Department maintains a number of research laboratories equiped with special purpose hardware. In addition, the Department has access to a large IBM mainframe facility run by the University Computing Center.

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 Engineering (M.E.)
Master of Science in Engineering (M.S.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, digital circuit design, microelectromechanical systems (MEMS) and the like. 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.

INDUSTRIAL AND MANAGEMENT SYSTEMS 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 Engineering (M.E.)
Master of Science in Engineering Science (M.S.E.S.)
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.)
Doctor of Philosophy in Engineering Science (Ph.D.)

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 which support class projects and research in microcomputer applications, computer-aided manufacturing, automation, and applications of robotics. Evening and off-campus programs are available through the Master of Science in Engineering Management (M.S.E.M.) program. The department also administers the manufacturing option in the M.S.E. program.

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.)

Coursework includes basic science and mathematics, thermal and fluid sciences, material science, solid mechanics, dynamics, machine design, vibrations, instrumentation and control.

Graduates of this program are employed in research, design, production, marketing, service, installation (contracting), maintenance and operation in such industries as mining, petroleum, paper, food, power, manufacturing, air-conditioning, defense systems, aerospace, data processing, communications, and automotive.

Laboratories are available for basic instrumentation, thermal and fluid sciences, solid mechanics, data acquisition and control, CAD/CAE, vibrations, and aerodynamics.

Preliminary Coursework for Engineering Students

Both the four-year and five-year curricula of the College of Engineering Bachelor of Science programs are founded on a set of coursework that is required of all engineering students. This coursework 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.

Each degree-granting department has developed a list of courses to provide key elements for the degree offered. While the specific courses will vary slightly from one department to another, the categories are as follows:

General Education Courses
(Social Sciences, Humanities, Communications)
Mathematics, Chemistry and Physics
Common Engineering Courses
Department Specialization

Special course requirements exist for Chemical Engineering, Computer Engineering, Computer Science, and Information Systems, and students selecting any of those fields should be aware of their specific requirements. Students may consult the degree granting department or the College's Advising Office for detailed information.

1. UNIVERSITY LIBERAL ARTS REQUIREMENTS

All students are required to take 42 semester hours to complete the University liberal arts requirements. Thirty-six (36) semester hours will satisfy the general education course requirements and 6 semester hours will satisfy the exit requirements. These requirements are distributed as follows:

General Education Requirements*	**Semester Hours**
English Composition	6
Quantitative Methods	6
Natural Sciences	6
Social Sciences	6
Historical Perspectives	6
Fine Arts	3
African, Latin American, Middle Eastern or Asian Perspectives	3
	36
Exit Requirements* (Must be taken at USF)	
Major Works and Major Issues	3
Literature and Writing	3

*Courses may be certified in more than one area, but students may use each course in ***only*** one (1) area.

Courses in the liberal arts requirements should incorporate the following components whenever they are relevant to the specific discipline: the learning skills of conceptual thinking, analytical thinking, creative thinking, written expression, oral expression, and the dimensions of values and ethics, international perspectives, environmental perspectives, race and ethnicity, and gender. When warranted by the subject matter, each course must incorporate consideration of at least one of the dimensions and one of the thinking skills to meet the liberal arts requirements.

Departments should ensure that courses proposed for the liberal arts have sufficient depth and breadth. These courses will share the substantive rigor and intellectual challenge of courses offered for major credit, with the specific feature of offering an integrative perspective of the discipline and its relationship to academia as a whole. Additionally, such courses will encourage majors to interact with students from other disciplinary backgrounds.

2. MATHEMATICS AND SCIENCE CORE REQUIREMENTS

In mathematics this 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 selective field of specialization, as specified by the department. In the science coursework students must take the Physics with Calculus sequence and General Chemistry course(s) depending on the degree-granting program.

Students whose high school preparation is insufficient to enter the Calculus for Engineers are required to take supplementary algebra and trigonometry prior to being considered for acceptance into the College.

FOUR-YEAR PROGRAMS

LEADING TO A BACHELOR OF SCIENCE DEGREE IN A DESIGNATED ENGINEERING FIELD

These engineering degrees are awarded upon successful completion of a program consisting of the required areas of coursework. Programs are offered in the following disciplines of Engineering:

• CHEMICAL ENGINEERING

Mission Statement

The mission of the Department of Chemical Engineering is to provide fundamental knowledge and contemporary skills for the development, economic design, and safe operation of chemical processes in a manner compatible with societal values.

Program Education Objectives

1. Our graduates will be able to apply engineering and scientific principles to the development , economic design, and safe operation of chemical processes in a manner compatible with societal values.
2. Our graduates will be able to build upon their undergraduate education, expanding and adapting their knowledge and skills in their chosen career path.
3. Our graduates will be able to function as professionals, working both as individual and as team members striving towards common objectives, communicating effectively and following appropriate ethical standards in the process.
4. Our graduates will be able to be productive members of society in general as a result of their technical abilities combined with their broad exposure to the humanities and awareness of societal and global issues.

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. Students seeking the Biotechnology/Biomedical Certificate are also required to take additional courses in general biology, microbiology, and biochemistry. Chemical 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 Engineering students must have access to an IBM compatible personal computer during their last two years of study. Those who do not own one will be severely disadvantaged.

Four-Year Curriculum - Chemical Engineering

In addition to the College's graduation requirements, all graduating seniors must take the Chemical Engineering Fundamentals of Engineering Examination.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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 Community College that will be accepted in the Math/Science/Engineering areas:

Communications:

ENC 1101/1102 English I and II (6)

Humanities & Social Sciences:

Humanities Courses (6)
Social Science Courses (6)
Humanities or Social Sciences (3)

Mathematics:

USF	C/C
MAC 2281	MAC 2311* (4)
MAC 2282	MAC 2312* (4)
MAC 2283	MAC 2313* (4)
MAP 2302	MAP 2302 (3)

*or MAC 2281, MAC 2282, MAC 2283

Natural Sciences:

USF	C/C
CHM 2045	CHM 1045* (3)
CHM 2045L	CHM 1045L* (1)
PHY 2048	PHY 2048 (3)
PHY 2048L	PHY 2048L (1)
PHY 2049	PHY 2049 (3)
PHY 2049L	PHY 2049L (1)

*or CHS 1440 Chemistry for Engineers

The schedule that follows indicates how a diligent student who can devote full time to coursework can satisfy requirements in four academic years. Students without a solid foundation or those who cannot devote full time to academics should plan a slower pace.

Semester I

ENC 1101	Composition I	3
MAC 2281	Eng. Calculus I	4
CHM 2045	General Chemistry I	3
EGN 3000	Found. of Engin.	1
ALAMEA Perspectives Elective		3
Fine Arts Elective		3
Total		17

Semester II

ENC 1102	Composition II	3
MAC 2282	Eng. Calculus II	4
CHM 2046	General Chemistry II	3
CHM 2045L	General Chem. I Lab	1
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Lab	1
Historical Perspectives Elective		3
Total		18

Semester III

MAC 2283	Eng. Calculus III	4
CHM 2046L	General Chem. II Lab	1

PHY 2049	General Physics II	3
PHY 2049L	General Phys. II Lab	1
EGN 3311	Statics	3
ECN 3211	Communications for Engineers	3
Total		15

Semester IV

MAP 2302	Differential Equations	3
EGN 3358	Thermo, Fluids & HT	4
EGN 3373	Circuits	3
EGN 3443	Engineering Statistics	3
EGN 3613	Engineering Economy	3
Total		16

Semester V

ECH 3023	Process Engineering I	4
ECH 3323L	Chem Lab I	1
ECH 4264	Transport Phenomena	3
CHM 2210	Org. Chem. I	3
CHM 2210L	Org. Chem. I Lab	2
CHM 4410	Physical Chemistry I	3
Total		16

Semester VI

ECH 4265C	Process Engineering II	4
ECH 4265L	Chem. Lab II	1
CHM 2211	Org. Chem. II	3
CHM 2211L	Org. Chem. II Lab	2
CHM 4412	Physical Chem. III	3
Total		13

Summer

Chemical Engineering Elective		3
Chemical Engineering Elective		3
EGN 3365	Materials Engineering I	3
Total		9

Semester VII

ECH 4415C	Proces Engineering III	4
ECH 4415L	Chem. Lab III	1
ECH 4845	Quant. Methods ChE	3
Chemical Engineering Design Elective		2
Social Science Elective		3
Historical Perpectives Elective		3
Total		16

Semester VIII

ECH 4323C	Automatic Controls I	4
ECH 4615	Plant Design	4
Social Science Elective		3
Science Elective		3
Total		14

• CIVIL AND ENVIRONMENTAL ENGINEERING

Mission Statement

The mission of the Department of Civil and Environmental Engineering is

1. to provide a quality educational experience for all students, both undergraduate and graduate, at the level of the top ranked universities in the nation;
2. to develop new knowledge, processes, or procedures through research which will benefit mankind; and
3. to provide service through professional activities.

Undergraduate Program, Vision and Guiding Principles

The Department will provide our undergraduate students with a 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 our students begin work upon graduation in industry or with governmental organizations, the curriculum is designed to prepare our 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.

Undergraduate Educational Objectives

1. The Department will provide undergraduate students with the strong technical education needed for a career in civil engineering.
2. The Department will provide undergraduate students with an eduction that prepares them to perform effectively in the workplace with the communication skills needed to deal with co-workers, clients, and the public.
3. The Department will provide undergraduate students with an education that allows them to understand the societal implications of engineering decisions and designs in both a local and global context and the ethical training to evaluate those implications.
4. The Department will provide undergraduate students with an education that promotes the full and continuing development of their potential as engineers and effective members of society.

Concentrations

In addition to designated common coursework in engineering mechanics, civil, and environmental engineering, students undertake a concentration of 9 hours of coursework plus a 3-hour capstone design course in one of the following areas: environmental engineering, water resources, structures, materials, geotechnical with emphasis on structures, geotechnical with emphasis on transportation, and transportation.

Departmental Policies

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

1. Mandatory academic advising of each student each term,
2. Exit Interviews as a graduation requirement for all students; and
3. Only 2 "D" grades in engineering courses can be used to fulfill graduation requirements.

Four-Year Curriculum - Civil Engineering

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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 Community College that will be accepted in the Math/Science/Engineering areas:

Communications:

ENC 1101/1102 English I and II (6)

Humanities & Social Sciences:

Humanities Courses (6)
Social Science Courses (6)
Humanities or Social Sciences (3)

Mathematics:

USF	**C/C**
MAC 2281	MAC 2311* (4)

MAC 2282	MAC 2312* (4)
MAC 2283	MAC 2313* (4)
MAP 2302	MAP 2302 (3)

*or MAC 2281, MAC 2282, MAC 2283

Natural Sciences:

USF	C/C
CHM 2045	CHM 1045* (3)
CHM 2045L	CHM 1045L* (1)
PHY 2048	PHY 2048 (3)
PHY 2048L	PHY 2048L (1)
PHY 2049	PHY 2049 (3)
PHY 2049L	PHY 2049L (1)

*or CHS 1440 Chemistry for Engineers

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

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 of 2.0 GPA; must have an overall GPA of 2.0 or better.

Semester I

ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry I Lab	1
EGN 3000	Foundations of Engineering	1
Social Science Elective		3
Total		15

Semester II

ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
CHM 2046	General Chemistry II	3
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Lab	1
EGS 1113	Introduction to Design Graphics	3
Total		17

Summer Semester

ALAMEA Perspective Elective		3
Historical Perspective Elective		3
EGN 3613C	Engineering Economy I	3
Total		9

Semester III

PHY 2049	General Physics II	3
PHY 2049L	General Physics II Lab	1
MAC 2283	Engineering Calculus III	4
EGN 3311	Statics	3
Historical Perspectives Elective		3
ENC 3211	Communication for Engineers	3
Total		17

Semester IV

MAP 2302	Differential Equations	3
EGN 3321	Dynamics	3
EGN 3343	Thermodynamics	3
EGN 3443	Engineering Statistics	3
EGN 3365	Materials I	3
Total		15

Semester V

EGN 3353	Fluid Mechanics	3
EGN 3331	Mechanics of Materials	3
EGN 3331L	Mechanics of Materials Lab	1
EVR 4001	Environmntal Engineering I	3
TTE 4004	Transportation Engineering I	3
EGN 4420	Numerical and Computer Tools	3
Total		16

Semester VI

CES 3102	Structures I	3
CWR 4204	Hydraulics	3
EGN 3373	Introduction to Electrical Systems I	3
CGN 3021L	Civil Engineering Lab	2
GLY 3850	Geology for Engineers	3
Total		14

Semester VII

CEG 4011	Geotechnical Engineering I	3
CEG 4011L	Geotechnical Engineering Lab	1
CES 4702	Concepts of Concrete Design	3
CE Concentration Requirement		3
CE Concentration Requirement		3
Total		13

Semester VIII

CGN 4122	Professional/Ethical Issues in Engineering MW/MI	3
CE Concentration Requirement		3
CE Capstone Design Requirement MW/MI		3
Fine Arts Elective		3
Social Science Elective		3
Total		15

CIVIL ENGINEERING CONCENTRATION AND CAPSTONE DESIGN REQUIREMENTS

Environmental Engineering

ENV 4417	Water Quality and Treatment	3
ENV 4552	Environmental Engineering Operations and Processes	3
CWR 4103	Water Resources Engineering I	3
CWR 4812	Capstone Water Resouces/ Environmental Design	3

Water Resources

CWR 4103	Water Resources Engineering I	3
CWR 4545	Water Resources Engineering II	3
ENV 4417	Water Quality and Treatment	3
CWR 4812	Capstone Water Resources/ Environmental Design	3

Structures

CES 4605	Concepts of Steel Design	3
Technical Elective		3
Technical Elective		3
CES 4740	Capstone Structural/Geotechnical/ Materials Design	3

Materials

EMA 4324	Corrosion of Engineering Materials	3
CGN 4851	Concrete Construction Materials	3
CES 4605	Concepts of Steel Design	3
CES 4740	Capstone Structural/Geotechnical/ Materials Design	3

Geotechnical with emphasis on Structrures

CEG 4012	Geotechnical Engineering II	3
CES 4605	Concepts of Steel Design	3
Technical Elective		3
CES 4740	Capstone Structural/Geotechnical/ Materials Design	3

Geotechnical with emphasis on Transportation

CEG 4012	Geotechnical Engineering II	3
SUR 2101	Surveying	3
Technical Elective		3
CEG 4850	Capstone Geotechnical/ Transportation Design	3

Transportation

TTE 4005	Transportation Engineering II	3
SUR 2101	Surveying	3
Technical Elective		3
CEG 4850	Capstone Geotechnical/ Transportation Design	3

• COMPUTER SCIENCE AND ENGINEERING

Mission Statement

In keeping with the mission of the College of Engineering, the Computer Science & Engineering Department strive 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. To educate undergraduates in the best practices of the field as well as integrate the latest research into the curriculum;
4. Foster the development of problem solving and communication skills as an integral component of the profession;
5. Provide quality learning experiences through small classes, active learning styles of teaching, and opportunities for meaningful interactions between students and faculty.

Objectives

The Computer Science & Engineering Department has established the following goals for graduates of our program:

1. Our graduates will be equipped with the knowledge and skills necessary to allow immediate employment as computer science and engineering professionals or to secure admission to graduate programs.
2. Our graduates will be prepared to function ethically and responsibly as full participants in our profession and our society.
3. Our graduates will have a thorough knowledge of the basic principles and practices of computing grounded upon the solid foundation of the principles of mathematics and science.
4. Our computer engineering graduates will have a thorough knowledge of the basic principles and practices of engineering based upon a solid foundation of mathematics and science and an ability to apply these principles in the computing domain.
5. Using their knowledge of basic computing principles, our computer science graduates will have acquired a knowledge of major areas of application of those funamentals.
6. Our information systems graduates will combine a thorough knowledge of basic business principles with the core principles of computing to achieve an understanding of applications at the convergence of these domains.

Three undergraduate degree tracks are offered within Computer Science and Engineering. These tracks are Computer Engineering, Computer Science and Information Systems, which lead to the Bachelor of Science in Computer Engineering, in Computer Science and in Information Systems respectively.

The Computer Engineering track emphasizes the application of engineering principles to the design of computer hardware and software. While all department tracks provide coverage of both computer hardware and software, this track allocates additional time to issues of computer architecture and hardware design. Students in this program also acquire a broad background in engineering science through the study of the engineering core.

The Computer Science track focuses on the theory of computation and computer organization. Additional course work in programming languages, algorithms, software engineering, and a wide range of electives supplement the core coverage of hardware and software.

The Information Systems track combines a basic coverage of hardware and software with a core of business related courses and additional course work in areas such as networks and database. The emphasis in this track is on the application of computing.

Graduates from these programs follow fruitful careers developing either scientific or business application's of computers, as well as in the design of computer systems. They are often involved in the systems level definition of information processing complexes for both manufacturers of computers and for users. A wide and expanding variety of design and applications opportunities characterize this field. The rapid growth and continual change within this field makes it essential for students to acquire a broad foundation in applied mathematics and the physical sciences, and to develop communication skills and to become familiar with the domains of potential computer application in the Humanities and Social Sciences. Research and development opportunities as a computer scientist and engineer, often following graduate education, are present in the areas of computer architecture and VSLI design, artificial intelligence, software engineering, digital data communications, multimedia, robotics, database, networks, user interface, fault-tolerant computing and testing, computer graphics, image processing and computer vision, and simulation.

The schedules which follow indicate how a serious, well prepared student who can devote full time to coursework can satisfy degree requirements in four academic years. Students without a solid foundation and those who cannot devote full time to academics should plan on a slower pace.

Four-Year Curriculum in Computer Science

In addition to the College's graduation requirements, the department has the policy of not accepting any D grade in department courses.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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
PHY	X049/X049L	4
or		
PHY	X049C	4

*Introductory Programming in Ada, C, C++, or PASCAL 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.

Department Admissions Requirements

Transfer students must have completed the equivalent USF Composition I & II, Engineering Calculus I & II and General

Physics I & II (with labs) with a grade point average of 3.00 or higher in all courses.

Semester I

MAC 2281	Engineering Calculus I	4
ENC 1101	Composition I	3
EGN 3000	Fundamentals of Eng	1
Science Elective		3
Social Science Elective		3
Total		14

Semester II

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

Summer Semester

MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Lab	1
Historical Perspectives Elect		3
Total		11

Semester III

CDA 3100	Computer Organization	3
COT 3100	Intro Discrete Str	3
COP 3514	Program Design	3
Historical Perspectives Elect		3
Total		12

Semester IV

EEL 4851	Data Structures	3
CDA 3201	Computer Logic Design	3
CDA 3201L	Computer Logic Design Lab	1
EGN 4450	Linear Systems	2
STA 4442	Intro to Probability	3
Fine Arts Elective		3
Total		15

Semester V

CDA 4205	Computer Architecture	3
COP 4600	Operating Systems	3
CS&E Theory Elective		3
Science Elective		3
Social Science Elective		3
Total		15

Semester VI

CS&E Theory Elective		3
CS&E Software Elective		6
CS&E Elective		6
Total		15

Semester VII

ENC 3211	Engr. Communications	3
ALAMEA Elective		3
CS&E Elective		6
Total		12

Semester VIII

CIS 4250	Ethical Issues	3
Humanities, Social Science or Fine Arts Elective		3
CS&E Elective		6
Total		12

Four-Year Curriculum in Computer Engineering

Courses indicated with XXXX had not yet been assigned a number when the catalog went to print. See your academic advisor for additional information.

In addition to the College's graduation requirements, the department has the policy of not accepting any D grade in department courses.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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

Communications:
ENC 1101/1102 English I and II (6)

Humanities & Social Sciences:
Humanities Courses (6)
Social Science Courses (6)
Humanities or Social Sciences (3)

Mathematics:

USF	**C/C**
MAC 2281	MAC 2311* (4)
MAC 2282	MAC 2312* (4)
MAC 2283	MAC 2313* (4)
MAP 2302	MAP 2302 (3)

*or MAC 2281, MAC 2282, MAC 2283

Natural Sciences:

USF	**C/C**
CHM 2045	CHM 1045* (3)
CHM 2045L	CHM 1045L* (1)
PHY 2048	PHY 2048 (3)
PHY 2048L	PHY 2048L (1)
PHY 2049	PHY 2049 (3)
PHY 2049L	PHY 2049L (1)

*or CHS 1440 Chemistry for Engineers

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

Department Admissions Requirements

Transfer students must have completed the equivalent USF Composition I & II, Engineering Calculus I & II and General Physics I & II (with labs) with a grade point average of 3.00 or higher in all courses.

Semester I

MAC 2281	Engineering Calculus I	4
ENC 1101	Composition I	3
EGN 3000	Fundamentals of Engineering	1
Social Science Elective		3
Historical Perspectives Elect.		3
Total		14

Semester II

MAC 2282	Engineering Calculus II	4
ENC 1102	Composition II	3
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Lab	1
CHM 2045	General Chemistry I	3
CHM 2045L	General Chemistry Lab	1
Total		15

Summer Semester

MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Lab	1
COP 2510	Programming Concepts	3
Total		11

Semester III

CDA 3100	Computer Organization	3
COT 3100	Intro Discrete Str	3
COP 3514	Program Design	3
Social Science Elective		3
MAP 4302	Differential Equations	3
Total		15

Semester IV

EEL 4851	Data Structures	3
CDA 3201	Computer Logic Design	3
CDA 3201L	Computer Logic Design Lab	1
EGN 3443	Engineering Statistics	3
EGN 3373	Electrical Sys. I	3
EGN 4450	Linear Systems	2
Total		15

Semester V

CDA 4205	Computer Architecture	3
EGN 4930	Eng. Econ. with Social & Global Implications	3
ALAMEA Elective		3
EGN XXXX	Eng. Electronic Materials	3
CS&E Hardware Elective		4
Total		16

Semester VI

COP 4600	Operating Systems	3
CS&E Theory Elective		3
CS&E Hardware Elective		3
Science Elective		3
Fine Arts Elective		3
Total		15

Semester VII

ENC 3211	Comm. For Engineers	3
Historical Perspectives Elect.		3
CS&E Elective		7
Total		13

Semester VIII

CIS 4910	Senior Project	2
CIS 4250	Ethical Issues	3
CS&E Elective		9
Total		14

Four-Year Curriculum in Information Systems

Courses indicated with XXXX had not yet been assigned a number when the catalog went to print. See your academic advisor for additional information.

In addition to the College's graduation requirements, the department has the policy of not accepting any D grade in department courses.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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
PHY	X049/X049L	4
or		
PHY	X049C	4

*Programming in Ada, C, C++, or PASCAL 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.

Department Admissions Requirements

Transfer students must have completed the equivalent USF Composition I & II, Engineering Calculus I & II and General Physics I & II (with labs) with a grade point average of 3.00 or higher in all courses.

Semester I

MAC 2281/2233	Calculus I	4
ENC 1101	Composition I	3
AGC 2021	Principles of Accounting I	3
Social Science Elective		3
Total		13

Semester II

MAC 2282/2234	Calculus II	4
ENC 1102	Composition II	3
PHY 2048/2053	Physics I	3
PHY 2048L/2053L	Physics I Lab	1
COP 2510	Programming Concepts	3
Total		14

Summer Semester

PHY 2049/2054	Physics II	3
PHY 2049L/2054L	Physics II Lab	1
ECO 2013	Macroeconomics	3
STA 2023	Intro to Statistics	3
Total		10

Semester III

CDA 3100	Computer Organization	3
COT 3100	Intro Discrete Str	3
COP 3514	Program Design	3
ECO 2023	Microeconomics	3
Historical Perspectives Elect		3
Total		15

Semester IV

EEL 4851	Data Structures	3
MAN 3023	Principles of Management	3
ALAMEA Elective		3
Science Elective		3
Social Science Elective		3
Total		15

Semester V

COP 4600	Operating Systems	3
EGN XXXX	Engineering Econ. with Social and Global Implications	3
EGN 4450	Linear Systems	2
ENC 3211	Comm. For Engineers	3

CS&E Software Elective		3
Total		14

Semester VI

CEN 4020	Software Engineering	3
Fine Arts Elective		3
CS&E Software Elective		3
CS&E Elective		6
Total		15

Semester VII

Historical Perspectives Elect		3
CS&E Theory Elective		3
CS&E Software Elective		3
Science Elective		3
Total		12

Semester VIII

CEN 4022	Software System Development	3
CIS 4250	Ethical Issues	3
CS&E Elective		6
Total		12

• ELECTRICAL ENGINEERING

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 emphasis 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 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 electronic, 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.

The schedule which follows indicates how a serious, well prepared student who can devote full time to coursework can satisfy degree requirements in four academic years. Students without a solid foundation and those who cannot devote full time to academics should plan on a slower pace. A minimum departmental GPA of 2.0 is required for graduation. In addition, students must pass all required BSEE courses, except humanities and social sciences, with a grade of "C" or better.

Four-Year Curriculum in Electrical Engineering

Courses indicated with XXXX had not yet been assigned a number when the catalog went to print. See your academic advisor for additional information.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

Students should complete the following **prerequisite courses** listed below at the lower level prior to entering the University. If these courses are not taken at the community college, they must be completed before the degree is granted.

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

Communications:
ENC 1101/1102 English I and II (6)

Humanities & Social Sciences:
Humanities Courses (6)
Social Science Courses (6)
Humanities or Social Sciences (3)

Mathematics:

USF	**C/C**
MAC 2281	MAC 2311* (4)
MAC 2282	MAC 2312* (4)
MAC 2283	MAC 2313* (4)
MAP 2302	MAP 2302 (3)

*or MAC 2281, MAC 2282, MAC 2283

Natural Sciences:

USF	**C/C**
CHM 2045	CHM 1045* (3)
CHM 2045L	CHM 1045L* (1)
PHY 2048	PHY 2048 (3)
PHY 2048L	PHY 2048L (1)
PHY 2049	PHY 2049 (3)
PHY 2049L	PHY 2049L (1)

*or CHS 1440 Chemistry for Engineers

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

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 of 2.0 GPA; must have an overall GPA of 2.0 or better.

Semester 1

ENC 1101	Composition. I	3
MAC 2281	Eng. Calculus I	4
Social Science Elective		3
Fine Arts Elective		3
EGN 2082	History of Electrotechnology	3
Total		16

Semester 2

ENC 1102	Composition II	3
MAC 2282	Eng. Calculus II	4
PHY 2048	Physics I	3
PHY 2048L	Physics Lab I	1
CHM 2045	Chemistry I	3
CHM 2045L	Chemistry Lab I	1
EGN 3000	Foundations of Engineering	1
Total		16

Semester 3

MAC 2283	Eng. Calculus III	4
PHY 2049	Physics II	3
PHY 2049L	Physics Lab II	1
EGN 3443	Eng. Prob. and Statistics	3
EGN 3613	Eng. Econ.	3
Total		14

Semester 4

MAP 2302	Differential Equations	3
EGN XXXX	Engineering Analysis	3
EGN 3373	Electrical Systems I	3
EEL 2161	EE Computing Methods	3
EGN XXXX	Eng. Electronic Materials	3
Total		15

Summer Term

EGN 2031	History of Technology	3
EEL XXXX	Elec. Systems Environments	3
ENC 3211	Comm. for Engineers	3
Total		9

Semester 5

EEL 3100	Network Analysis	3
EEL 4705	Logic Design	3
EEL 4705L	Logic Lab	1
EEL 3301L	Lab I (Curcuits)	1
EEL 4472	Electromagnetics	3
EEL 4351	Semiconductor Devices	3
Total		14

Semester 6

EEL 4102	Linear Systems Anal.	3
EEL 3375	Indus. Mach. & Power Appl.	3
EEL 4744	Microprocessors	3
EEL 4744L	Microprocessor Lab	1
EEL 3302	Electronics I	3
EEL XXXX	Wireless Circuits & Systems Lab	2
Total		15

Semester 7

EEL 4906	Prof. Issues & Eng. Design*	3
EEL 3302L	EE Lab II (Electronics)	1
EEL 4657	Linear Systems Controls	3
EEL XXXX	Controls Lab	1
EEL 4305	Electronics II	3
EEL 4512	Communication Systems	3
Total		14

*This course fulfills a Major Works/Major Issues Requirement.

Semester 8

EELXXXX	EE Design Project	3
Social Science Elective		3
Tech Elective		3
Tech Elective		3
ALAMEA		3
Total		15

• INDUSTRIAL AND MANAGEMENT SYSTEMS ENGINEERING

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

The Department's objectives are to

1. provide students with a thorough understanding of the concepts and pratices of industrial and systems engineering and the related mathematical and scientific principles.
2. provide students with an understanding of the ethical, human, and business aspects of engineering activities.
3. provide students with the ability to think creatively, to communicate effectively, and to work in teams.
4. prepare and motivate students to have successful careers, to pursue graduate studies and other life-long learning opportunities, and to actively participate in society.

Students pursuing the Bachelor of Science in Industrial Engineering degree program take designated, specialized coursework in industrial processes, work analysis, production control, facilities design, operations research, human factors, computer simulation, quality control, and robotics and automation. This coursework is supplemented by engineering electives and comprehensive industrial engineering design projects.

Students completing this program are prepared for graduate study or for careers in a broad range of industries, business, and public service areas. The strength of industrial engineering lies, in part, in its breadth and the applicability of its common body of knowledge in a wide variety of enterprises. Students may be involved in traditional areas of manufacturing and production, or state-of-the-art functions in automation and robotics. The same engineering principles are also applied to business organizations, service delivery systems, i.e. airlines, banks, hospitals, etc. and governmental administration.

The schedule which follows indicates how a serious, well prepared student who can devote full time to coursework can satisfy degree requirements in four academic years. Students without a solid foundation and those who cannot devote full time to academics should plan on a slower pace.

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, and;
3. All graduating seniors must take the Fundamentals of Engineering Examination.

Four-Year Curriculum in Industrial and Management Systems Engineering

Courses indicated with XXXX had not yet been assigned a number when the catalog went to print. See your academic advisor for additional information.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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

Communications:
ENC 1101/1102 English I and II (6)

Humanities & Social Sciences:
Humanities Courses (6)
Social Science Courses (6)
Humanities or Social Sciences (3)

Mathematics:

USF	C/C
MAC 2281	MAC 2311* (4)
MAC 2282	MAC 2312* (4)
MAC 2283	MAC 2313* (4)
MAP 2302	MAP 2302 (3)

*or MAC 2281, MAC 2282, MAC 2283

Natural Sciences:

USF	C/C
CHM 2045	CHM 1045* (3)
CHM 2045L	CHM 1045L* (1)
PHY 2048	PHY 2048 (3)
PHY 2048L	PHY 2048L (1)
PHY 2049	PHY 2049 (3)
PHY 2049L	PHY 2049L (1)

*or CHS 1440 Chemistry for Engineers

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

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 of 2.0 GPA; must have an overall GPA of 2.0 or better.

Semester I

CHM 2041	Chemistry I	3
CHM 2045L	Chemistry I Lab	1
EGN 3000	Foundations of Engineering	1
ENC 1101	Composition I	3
MAC 2281	Eng. Calculus I	3
Social Science Elective		3
Total		14

Semester II

CHM 2042	Chemistry II	3
EGN 2031	History of Technology	3
ENC 1102	Composition II	3
MAC 2282	Eng. Calculus II	4
PHY 2048	Physics I	3
PHY 2048L	Physics I Lab	1
Total		17

Semester III

EGN 3443	Engineering Probability Statistics I	3
MAC 2283	Calculus III	4
PHY 2049	Physics II	3
PHY 2049L	Physics II Lab	1
Historical Perspectives		3
Total		14

Semester IV

EGN 3311	Statics	3
EGN 3373	Electrical Systems Engineering I	3
EGN 4450	Linear Systems	2
MAP 2302	Differential Equations	3
Fine Arts Elective		3
Total		14

Summer Term

EGN 1113	Engineering Graphics	3
EGN 4930	Engineering Econ. with Social and Global Implications	3
ALAMEA Elective		3
Total		9

Semester V

COP 2510	Programming Concepts	3
EGN 3365	Materials Engineering I	3
EIN 4312	Work Analysis	2
EIN 4312L	Work Analysis Lab	1
EIN 4411	Manufacturing Processes	2
EIN 4411L	Manufacturing Processes Lab	1
ESI 4312	Deterministic OR	3
Total		15

Semester VI

EGN 3343	Thermodynamics	3
EIN 4333	Production Control	3
EIN 4601	Automation/Robotics	2
EIN 4601L	Automation/Robotics Lab	1
ESI 4313	Probabilistic OR	3
Tech Elective	Engineering Science	3
Total		15

Semester VII

EIN 4364	Facilities Design I	2
EIN 4364L	Facilities Design I Lab	1
EIN 4933	Management Cost	3
ESI 4244	Design of Experiments	3
ESI 4523	Simulation	2
ESI 4523L	Simulation Lab	1
Tech Elective	Industrial Engineering	3
Total		15

Semester VIII

EIN 4313	Human Factors	2
EIN 4313L	Human Factors Lab	1
EIN 4365	Facilities Design II	3
ESI 4221	Industrial Statistics/Quality	2
ESI 4221L	Industrial Statistics/Quality Lab	1
ENC 3211	Communication for Engineers	3
Tech Elective		3
Total		15

• MECHANICAL ENGINEERING

Mission Statement

The Mission of the Mechanical Engineering Department is:

a. to provide a quality 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, conferences and continuing education;
d. to advance the profession through service within the associated societies and;
e. to promote activities which serve global development.

Objectives

The Objectives of the Undergraduate Program in Mechanical Engineering are:

A. to teach students to understand and to apply concepts of basic science, mathematics, computation, and engineering science essential to professional practice;
B. to train students in the design of experiments and testing of systems, in proper instrumentation methods, in the techniques of modern data acquisition and in methods of data interpretation;
C. to develop skills essential to the design process, including problem formulation, synthesis, analysis, construction, testing and evaluation;
D. to develop skills necessary for effective professional interaction including multi-disciplinary collaboration and successful oral and written communication;
E. to encourage an understanding of technology within a global and societal context, the need for continued professional development, the importance of professional responsibility and the ethics of professional practice.

Students pursuing the Bachelor of Science in Mechanical Engineering program take coursework in thermodynamics and heat transfer; instrumentation and measurements, energy conversion systems, solid and fluid mechanics, dynamics, machine analysis and design, mechanical design, vibrations and controls. This is supplemented by elective coursework in such areas as power plant analysis, refrigeration and air conditioning, mechanical design, advanced mechanics, ro-

botics, propulsion, computer-aided design, manufacturing, composite materials, and aerodynamics.

Students completing this program normally enter careers in a wide range of industries which either produce mechanical products or rely on machines, mechanical devices and systems to produce electricity, petroleum products, foods, textiles, building materials, etc. Mechanical Engineering graduates may follow careers in such fields as transportation, power generation, manufacturing, instrumentation, automatic control, machine design, construction, refrigeration, heating and air conditioning, aerospace, defense and all the process industries (foods, textiles, petrochemicals, pharmaceuticals, etc.). There are abundant career opportunities in a wide range of industries because mechanical equipment is required in every aspect of modern industry.

Four-Year Curriculum in Mechanical Engineering

Courses indicated with XXXX had not yet been assigned a number when the catalog went to print. See your academic advisor for additional information.

Prerequisites (State Mandated Common Prerequisites) for Students Transferring from a Community 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.

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

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

Communications:

ENC 1101/1102 English I and II (6)

Humanities & Social Sciences:

Humanities Courses (6)
Social Science Courses (6)
Humanities or Social Sciences (3)

Mathematics:

USF	C/C
MAC 2281	MAC 2311* (4)
MAC 2282	MAC 2312* (4)
MAC 2283	MAC 2313* (4)
MAP 2302	MAP 2302 (3)

*or MAC 2281, MAC 2282, MAC 2283

Natural Sciences:

USF	C/C
CHM 2045	CHM 1045* (3)
CHM 2045L	CHM 1045L* (1)
PHY 2048	PHY 2048 (3)
PHY 2048L	PHY 2048L (1)
PHY 2049	PHY 2049 (3)
PHY 2049L	PHY 2049L (1)

*or CHS 1440 Chemistry for Engineers

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

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 of 2.0 GPA; must have an overall GPA of 2.0 or better.

Semester I

ENC 1101	Composition I	3
MAC 2281	Engineering Calculus I	4
CHM 2045	General Chemistry I	3
CHM 2045L	Chemistry Lab I	1
EGS 1113	Intro. to Design Graphics	3
EGN 3000	Foundations of Engineering	1
Total		15

Semester II

ENC 1102	Composition II	3
MAC 2282	Engineering Calculus II	4
PHY 2048	General Physics I	3
PHY 2048L	General Physics I Lab	1
Fine Arts Elective		3
Total		14

Semester III

MAC 2283	Engineering Calculus III	4
PHY 2049	General Physics II	3
PHY 2049L	General Physics II Lab	1
EGN 3311	Statics	3
Social Science Elective		3
Total		14

Semester IV

MAP 2302	Differential Equations	3
EGN 3321	Dynamics	3
EGN 3365	Materials Engineering I	3
EGN 3373	Electrical Systems I	3
Historical Perspectives		3
Total		15

Summer Term

EGN 3443	Eng Statistics & Prob.	3
EGN 3343	Thermodynamics I	3
EML 3500	Mechanics of Solids	3
EGN 2031	History of Technology	3
Total		12

Semester V

EML 3762	Kin. & Dyn. of Machinery	3
EML 3041	Computational Methods	4
EML 3701	Fluid Systems	3
ENC 3211	Comm. for Engineers	3
EGN 4366	Materials Engineering II	3
Total		16

Semester VI

EML 4501	Machine Design	3
EML 3303	Mechanical Engineering Lab I	3
EML 4142	Heat Transfer I	3
EML 4106	Thermal Syst.	3
EGN 3613	Eng. Eco. with Social & Global Impl.	3
Total		15

Semester VII

EML 4325	Mechanical Manufacturing Processes	3
EML 4302	Mechanical Engineering Lab II	3
EML 4220	Vibrations	3
EML 4551	Capstone Design (MWMI)	3
ALAMEA Perspectives Elective		3
Total		15

Semester VIII

EML 4312	Mechanical Controls	3
Social Science Elective		3
Approved Technical/Design Elective		3
Approved Technical/Design Elective		3
Total		12

College Regulations

1. GENERAL EDUCATION REQUIREMENTS

While the Engineering undergraduate student is expected to complete certain requirements during the first two years of study which are directed toward the humanities and social sciences, and which are fulfilled by the completion of the General Education requirements of the University, the College of Engineering expects more of its prospective engineering graduates than this minimum. The engineer must not only be a technically competent individual, but must also be a person who can understand, adjust and contribute to the social environment.

Students who transfer from a State of Florida community college with an Associate of Arts degree and who have met that college's General Education Requirement will find their General Education coursework satisfies the University General Education Requirements.

All Engineering students must complete the USF Exit Requirements. The Literature and Writing portion can be met by completing ENC 3211 Communication for Engineers.

2. ENGLISH REQUIREMENT

Students who have been admitted to the College of Engineering may be required to take an examination in order to evaluate their preparedness in the use and understanding of the English language. The faculty of the University's English program will administer the examination.

Students evidencing an English deficiency will be required to initiate the necessary corrective programs, with the assistance of their advisors. It is recognized that such deficiencies can exist even though a student has met the University's minimum English requirements. Correction of any deficiency must commence the term after a student has been notified and must be completed prior to recommendation of the student for graduation by the faculty of the College.

See *Continuation and Graduation Requirements* below for minimum grade requirements.

3. MATHEMATICS REQUIREMENT

Students who are pursuing an engineering program are expected to acquire a facility for the rapid and accurate solution of problems requiring the use of mathematics. This requirement includes the ability to translate physical situations into mathematical models. Students evidencing a lack of manipulative ability or of the ability to apply mathematics will be required to take remedial coursework in engineering analysis and problem solving that is over and above their regular degree requirements. Faculty of the College who encounter students who are deficient in their mathematical ability will refer such cases to the Advising Office.

4. CONTINUATION AND GRADUATION REQUIREMENTS

To meet graduation requirements all undergraduate students must maintain above the minimum cumulative overall GPA of 2.00. In addition the College of Engineering also requires undergraduate students to maintain a minimum of 2.0 GPA in all engineering courses attempted, as well as 2.0 GPA in all courses attempted in their specialization. In no case will the minimum GPA for a category be less than 2.0. It is the student's responsibility to make sure she/he meets all departmental requirements. In addition to the completion of the coursework and/or project requirements of the respective program of the College, students must be recommended for their degrees by the faculty of the College.

Students who do not maintain the required minimums of the program pursued in each category are ineligible for further registration in the College unless individually designed continuation programs are recommended by the student's academic advisor and approved by the department chairperson and the Engineering Associate Dean for Academic Affairs. All students who are academically dismissed from the University will be denied readmission to the College of Engineering unless they meet admission requirements in effect at the time readmission is sought and are recommended for readmission by the department and the Associate Dean for Academic Affairs.

Students who register for a course three times without receiving a grade "D" or better (i.e., receive grades of W or F) will be denied further enrollment in the College of Engineering unless written permission is obtained from the department chairperson and the College Associate Dean for Academic Affairs.

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. Exceptions require written approval of the department advisor prior to registration.

The College of Engineering requires that a student completes the baccalaureate degree within five years after beginning the Engineering specialization courses. Any exceptions require approval of the department and Dean's Office.

Each engineering student is required to complete the *Application for Graduation - Check List* and submit it to the College of Engineering Advising Office by the drop date of the term prior to the semester in which graduation is sought. Completion of this form is a requirement for graduation.

Effective Fall of 2000 students pursuing Bachelor of Science in Chemical Engineering will be required to take the discipline oriented Fundamentals of Engineering exam. Effective Fall of 2001 students pursuing the Bachelor of Science in Industrial Engineering will be required to take the Fundamentals of Engineering exam. Engineering students in other disciplines are strongly encouraged to do the same. (See the College Advising Office for applications and information.)

5. TRANSFER CREDIT

The USF College of Engineering will accept transfer credit when appropriate if the transferred course has been passed with a grade of "C" or better. In some cases credit for a course *may* be granted, but the hours accepted may be less than the hours earned at another school.

While credit for work at other institutions may be granted subject to the conditions of the previous paragraph, a *minimum* of thirty semester hours of engineering coursework specified by the degree-granting department is required for a baccalaureate degree.

FIVE-YEAR PROGRAMS
LEADING TO BACHELORS AND MASTERS DEGREES IN ENGINEERING

Students who, at the beginning of their senior year, are clearly interested in graduate study are invited to pursue a Five-Year Program of study leading simultaneously to the Bachelor of Science in Engineering or Engineering Science and Master of Science in Engineering or Engineering Science degrees. The general basis of the five-year program includes

1. A two-year research program extending through the fourth and fifth year.
2. The opportunity of taking some graduate courses during the fourth year and deferring the taking of some senior courses to the fifth year. The requirements of the combined degrees do not differ from those for the two degrees pursued separately.

Students apply for admission to this program through their advisor, who should be consulted when additional information is needed. Departmental expectations and general admission requirements include

1. Senior standing (90 credits) with at least 16 upper level engineering credits completed at the University of South Florida with a 3.0 GPA.

2. A minimum score of 1000 on the verbal and quantitative portions of the Graduate Records Examination.
3. Above-average performance in the chosen Engineering program.

Certificate Programs

CERTIFICATE IN BIOMEDICAL ENGINEERING

Biomedical Engineering is a highly interdisciplinary field where basic engineering principles are applied to problems in the biomedical sciences. Typical specific areas of interest include: understanding basic biochemical and physiological processes, designing and analyzing medical diagnostics and procedures, evaluation and design of health care systems and facilities, design and valuation of prosthetic devices, an general biomedical product development. The College of Engineering offers an undergraduate Enhancement Certificate in Biomedical Engineering. There are two main purposes for the certificate program 1) to accommodate students interested in entering medical school following graduation (this program satisfies most of the typical minimal admission standards for medical school); and 2) to prepare students for graduate education program, drawing from all engineering disciplines, biology, physical sciences, biomedical and clinical sciences. Undergraduate students anticipating graduate studies in the bioengineering area (or related fields such as medicine) are strongly encouraged to gain research experience as part of their program. Research possibilities exist in Engineering, the Health Sciences Center, Public Health, and Arts and Sciences.

The Certificate in Biomedical Engineering provides students an opportunity to get an introduction to a rapidly developing field of study and to receive recognition for their endeavors. Students in the program must fulfill all the requirements for an Engineering undergraduate degree, such as Bachelor of Science in Chemical Engineering and also meet the additional requirements of the Certificate program.

Chemistry/Biology (10 hours min.)
- BSC 2010 Biology II - Cellular Processes*
- BCH 3023 Biochemistry**

One of the following Organic Chemistry sequences:
- CHM 2210 Organic Chemistry I*
- CHM 2211 Organic Chemistry II*
- CHM 2200 Organic Chemistry***

Other "human sciences" (6 hrs. min.)
- PSY 3044 Experimental Psychology**

One of the following:
- PET 3310 Kinesiology
- PET 3351 Exercise Physiology I
- EXP 4104 Sensory Processes
- PSB 4013C Neuropsychology
- (or approved substitute)

Engineering (9 hrs. min.****)
- ECH 5746 Intro to Biomedical Engineering

One or more of the following (to achieve 9 hrs. min. in area):
- EIN 4313L Human Factors
- EIN 5245 Work Physiology & Biomechanics
- ECH 5747 Selected Topics in Chemical Engineering Biotechnology
- ECH 5748 Selected Topics in Biomedical Engineering
- ECH 5747 Pharmaceutical Engineering
- ECH 5910 Directed Research in Bioengineering
- (or other approved Engineering courses)

*These courses are typically required for Medical School admission. Note that there may be other required courses, such as a course in Human Genetics and the Organic Chemistry laboratories.

**These courses are not normally required for Medical School admission, but are often "highly recommended."

***This is a single semester course in Organic Chemistry. This course does not normally satisfy the admission requirements of most medical schools. It also does not count towards the Chemical Engineering degree (students must take the full year sequence).

****It is important to note that these engineering courses are above and beyond the courses necessary to satisfy the 128 or 134 hour requirement. That is, these courses will not also qualify as engineering electives towards the B. S. requirements for any of the departmental degree programs.

CERTIFICATE OF TOTAL QUALITY MANAGEMENT

An undergraduate student, or graduate engineer, may enhance their professional achievement by receiving a Certificate in Total Quality Management. The student must satisfactorily complete five courses (15 credit-hours) of the eight courses in Total Quality Management. Enrollment is through the Department of Industrial and Management Systems Engineering.

CERTIFICATE OF ENHANCEMENT

The Certificate of Enhancement in (a designated engineering discipline) provides students an opportunity to gain an enhanced experience in their chosen field while pursuing an engineering degree and to permit them to receive recognition for the same requirements. At the present time, there are three certificates: Transportation Engineering and Wireless Engineering.

Requirements:

1. Enrolled in a Bachelor of Science degree program in a specified engineering discipline.
2. A minimum of 15 hours of additional elective courses, not included as a part of the B. S. degree, from an approved list. Courses must be taken on a letter-grade basis, and a minimum of 9 hours must be in engineering courses.
3. A G.P.A. of 2.0 or greater for the additional hours.
4. The student must receive the engineering degree to receive the Certificate of Enhancement.

Please contact the appropriate department chairperson to be accepted in the program.

Computer Service (SC) Courses

These courses marked SC are specifically designed for the non-engineering student.

Recognizing that the general purpose digital computer has made significant contributions to the advancement of all elements of the academic community and that it will have an ever greater impact in the future, the College of Engineering offers several levels of credit coursework, both undergraduate and graduate, to serve students of all colleges in order that they may be prepared to meet the computer challenge.

Computer-oriented courses are offered in two broad categories: (1) those courses which are concerned with the operation, organization and programming of computers and computer systems from the viewpoint of examining the fundamental principles involved in computer usage; and (2) those courses which are concerned with computer applications to a variety of different disciplines, by means of user-oriented-languages such as FORTRAN, COBOL, BASIC, "C," JAVA, VISUAL BASIC and ADA.

Students in engineering, the physical sciences, and mathematics must consult their advisor for suitable computer courses, since these courses are not acceptable to a number of degree programs.

College Facilities

Each of the departments has several modern well-equipped laboratories that are used for undergraduate teaching. Some examples of specialized equipment available are a scanning electron microscope, a gas chromatograph mass spectrometer, a 250,000 lb. material testing machine, several microprocessor-based control systems, industrial robots, a low turbulence subsonic wind tunnel, computer numerical controlled machinery, metal organic chemical vapor deposition systems, and integrated circuits design workstations.

College Computing Facilities

The College provides access to centralized computing facilities to undergraduate and graduate students. Most engineering departments also provide students with local facilities. The University is an Internet2 site and links are available to directly connect to all major supercomputing centers in the country.

The College provides enterprise level servers for computing, mail, file, web and database services for students and faculty. The College operates teaching and open-access labs for student use. These labs are equipped with large number of modern (Dell) PCs using Windows 2000 operating system and Unix workstations (Sun Ultra *5).* All lab computers have all of the necessary software required for coursework as well as other standard productivity software. The College also supports a state-of-the-art multimedia lab with document scanners and CD-ROM burner.

Standard programming languages such as FORTRAN, Basic, Pascal, C, C++ and Java are provided on these machines. General-purpose software such as Office 2000, MS visual studio and specialized engineering software including mathematical packages (MathCad, Matlab, Maple, Macsyma, TK Solver), statistical package (SAS), discipline specific application packages such as Abaqus, Ansys, ARENA, Aspen, Cadence and Labview are provided on Unix and Windows 2000 platforms on the network and in the labs. Several database management system software packages such as Oracle 8i, MySQL, MSSQL 8 and MS Access are available for classwork. Multi-media software packages such as MS FrontPage, Adobe Acrobat, Illustrator, Photoshop, Omni Page Pro, Paint Shop Pro, Macromedia Dreamweaver and Flash are available in the multi-media lab. The university has also entered an agreement with Microsoft Corporation for upgrade of standard office application, development tools and desktop operating systems.

The college-wide Ethernet network is connected to the USF campus-wide Gigabit Ethernet backbone. Within the College connections are provided to laboratories via 100 Mbps Ethernet. The university's Internet2 connection links it to more than 150 major universities and research institutions in the nation. Dial-in access is available to students from a large USF modem bank as well as through broadband connection. The distance learning (FEEDS) studios provide computer demonstrations for remote classes through the network. Additionally, most departments operate discipline specific computing lab(s).

Cooperative Education Program

A wide variety of industries and government agencies have established cooperative programs for engineering students to provide them the opportunity to become familiar with the practical aspects of industrial operations and engineering careers. Students in the Career Resource Center's Cooperative Education (Co-op) program alternate periods of paid employment in their major field with like periods of study. Students following the Co-op program usually encounter no problems in scheduling their program, since required Social Science and Humanities, Mathematics and Science, and Engineering Common courses are offered every semester. Students normally apply for participation in this program during their sophomore year and pursue actual Co-op employment during their sophomore and junior years. The senior year is generally pursued on a full-time study basis, since many specialization courses are not offered every semester. The students receive a Cooperative Education Certificate upon successful completion of a minimum of two work assignments.

Army & Air Force R.O.T.C. For Engineering Students

The Engineering curriculum, coupled with involvement in the Army or Air Force R.O.T.C. program, requires a minimum of five (5) years to complete the degree requirements. Army and Air Force R.O.T.C. cadets must take 16 additional hours in either military science or aerospace studies. Additionally, Air Force-sponsored summer training camp is scheduled between the sophomore and junior year for Air Force cadets, and Army cadets attend an Army-sponsored summer training program between the junior and senior years.

ENGINEERING FACULTY

CHEMICAL ENGINEERING

Interim Chair: S.C. Kranc; *Professors:* J.C. Busot, L.H. Garcia-Rubio, R. Gilbert, J.A. Llewellyn, C. A. Smith, A. K. Sunol; *Associate Professors:* V.R. Bhethanabotla, S.W. Campbell, W.F. Lee, III; *Assistant Professor:* J.T. Wolan; *Instructor:* C.J. Biver; *Visiting Assistant Professor:* M. VanAuker; *Courtesy Faculty:* R. Malone, N. Poor, M. Woodle.

CIVIL AND ENVIRONMENTAL ENGINEERING

Chairperson: William C. Carpenter; Professors Emeriti: J.E. Griffith; *Professors:* M.W. Anderson(Interim COE Dean), R.P. Carnahan, W.C. Carpenter, S.C. Kranc, R.J. Murphy, A.A. Sagues, R. Sen; *Associate Professors:* M. Gunaratne, A. Levine, J.J. Lu, R.M. Pendyala, M.A. Ross, R.I. Stessel, D. Smith, A. Zayed; *Assistant Professors:* A. Ashmawy, A. Ayoub, J.F. Devine, J.T. Franques, G. Mullins, N. Nachabe; *Instructors:* T.K. Davis, K. Nohra; *Courtesy Faculty:* F.R. Jones, J. Obeysekera, S.E. Polzin, N. Poor, J.B. Rose, R.C. Sheck, F.L. Young.

COMPUTER SCIENCE AND ENGINEERING

Chairperson: A. Kandel; *Professors:* K. Bowyer, D. Goldgof, L. Hall, A. Kandel, R. Perez, L. Piegl, N. Ranganathan, M. Varanasi; *Associate Professors:* S. Al-Arian, W. Albrecht, K. Christensen, P. Maurer, R. Murphy, D. Rundus, S. Sarkar; *Assistant Professors:* E. Fink, S. Katkoori, W. Mak.

ELECTRICAL ENGINEERING

Chairperson: E. K. Stefanakos; *Professors:* J. M. Anthony, Y. Chiou, R.E. Henning, V.K. Jain, M. G. Kovac, D.L. Morel, R. Sankar, A.D. Snider, E.K. Stefanakos, T.E. Wade; *Associate Professors:* K.A. Buckle, L.P. Dunleavy, C.S. Ferekides, A.M. Hoff, W.A. Moreno, P.H. Wiley; *Assistant Professors:* S. Bhansali, R. Schlaf, T.M. Weller; *Lecturers:* H.C. Gordon, F.D. King, J.T. Leffew.

INDUSTRIAL AND MANAGEMENT SYSTEMS

Chairperson: P.E. Givens; *Professors:* P. E. Givens, L. Martin-Vega, S. K. Khator, O. G. Okogbaa, W. A. Miller; *Associate Professors:* A. L. Callahan, T. K. Das; *Assistant Professors:* M X. Weng, A. Yallin; *Visiting Assistant Professor:* G. Centeno; *Lecturers:* S. N. Busansky, D. K. Gooding, P. R. McCright; *Adjuncts:* M. Du, J. Larsen, A. Montefusco, P. Robinson.

MECHANICAL ENGINEERING

Chairperson: R. V. Dubey; *Professors:* R.A. Crane, R.V. Dubey, D.P. Hess, A.K. Kaw, J.L.F. Porteiro; *Associate Professors:* G.H. Besterfield, A. Kumar, M.M. Rahman, S. Wilkinson; *Assistant Professors:* T. G. Eason III; *Adjuncts:* R.L. Mann; *Professor Emeritus:* S. J. Ying.

ENGINEERING COURSES

BASIC AND INTERDISCIPLINARY ENGINEERING

EGN 2031 History of Technology *HP*	(3)
EGN 2080 Light and the Arts: A Quantitative Approach *FA*	(3)
EGN 2082 History of Electrotechnology *HP*	(3)
EGN 2210 Computer Tools for Engineers	(3)
EGN 3000 Foundations of Engineering	(1)
EGN 3311 Statics	(3)
EGN 3321 Dynamics	(3)
EGN 3331 Mechanics of Materials	(3)
EGN 3331L Mechanics of Materials Laboratory	(1)

EGN 3343 Thermodynamics I (3)
EGN 3353 Basic Fluid Mechanics (3)
EGN 3358 Thermodynamics, Fluids, and Heat Transfer (4)
EGN 3365 Materials Engineering I (3)
EGN 3373 Electrical Systems I (3)
EGN 3374 Electrical Systems II (3)
EGN 3375 Electromechanical Systems (3)
EGN 3420 Engineering Analysis (3)
EGN 3443 Engineering Statistics I (3)
EGN 3613C Engineering Economy I (3)
EGN 4366 Materials Engineering II (3)
EGN 4420 Numerical and Computer Methods in Engineering (3)
EGN 4450 Introduction to Linear Systems (2)
EGN 4831 Technology and Society *MW* (3)
EGN 4905 Independent Study (1-5)
EGN 4930 Special Topics in Engineering (1-3)
EGN 5421 Engineering Applications for Vector Analysis (3)
EGN 5422 Engineering Applications of Partial Differential Equations (3)
EGN 5423 Natural Networks and Mathematical Communication (3)
EGN 5424 Engineering Applications of Complex Analysis (3)
EGN 5425 Engineering Applications of Advanced Matrix Computations (3)
EGS 1113 Introduction to Design Graphics (3)
ESI 4161C Computers in Industrial Engineering (3)
ESI 4313 Probabilistic O. R. (3)

CHEMICAL ENGINEERING

ECH 3023C Introduction to Process Engineering (4)
ECH 3023L Chemical Engineering Lab I (1)
ECH 3358 Basic Thermodynamics, Fluids and Heat Transfer (4)
ECH 3702 Instrument Systems I (4)
ECH 4123C Phase and Chemical Equilibria (3)
ECH 4244L Chemical Engineering Laboratory II (2)
ECH 4264 Transport Phenomena (3)
ECH 4265C Process Engineering 2: Separation Processes (4)
ECH 4265L Chemical Engineering Lab II (1)
ECH 4323C Automatic Control I (4)
ECH 4415C Process Engineering 3: Reacting Systems (4)
ECH 4415L Chemical Engineering Lab III (1)
ECH 4605 Strategies of Process Engineering (3)
ECH 4615 Plant Design *MW* (3)
ECH 4845 Quantitative Methods in Chemical Engineering (3)
ECH 4905 Independent Study (1-4)
ECH 4930 Special Topics in Chemical Engineering I (1-4)
ECH 4931 Special Topics in Chemical Engineering II (1-4)
ECH 5285 Transport Phenomena (3)
ECH 5324 Automatic Process Control II (3)
ECH 5747C Selected Topics in Chemical Engineering Biotechnology (1-3)
ECH 5820 Product Development (2)
ECH 5930 Special Topics III (1-4)
ECH 5931 Special Topics IV (1-4)

CIVIL AND ENVIRONMENTAL ENGINEERING

CCE 4034 Construction Management (3)
CCE 5035 Construction Management & Planning (3)
CEG 4011 Geotechnical Engineering I (3)
CEG 4011L Geotechnical Laboratory (1)
CEG 4012 Geotechnical Engineering II (3)
CEG 4850 Capstone Geotechnical/Transportation Design *MW* (3)
CEG 5115 Foundation Engineering (3)
CEG 5205 Laboratory Testing for Geotechnical Engineers (3)
CES 3102 Structures I (3)
CES 4000 Structures and The Urban Environment for Non-Engineers *6A MW* (3)
CES 4141 Matrix Structural Analysis (3)
CES 4561 Computer Aided Structural Design (3)
CES 4605 Concepts of Steel Design (3)
CES 4702 Concepts of Concrete Design (3)
CES 4720 Capstone Structural/Materials Design (3)
CES 4740 Capstone Structural/ Geotechnical/ Material Design *MW* (3)
CES 4742 Concepts of Structural Design (3)
CES 4820C Timber and Masonry Design (3)
CES 5105C Advanced Mechanics of Materials I (3)
CES 5209 Structural Dynamics (3)
CES 5715C Prestressed Concrete (3)
CGN 3021L Civil Engineering Laboratory (2)
CGN 4122 Professional and Ethical Issues in Engineering *MW* (3)
CGN 4851 Concrete Construction Materials (3)
CGN 4905 Independent Study (1-5)
CGN 4911 Research in Civil Engineering and Environmental Engineering (1-4)
CGN 4914 Senior Project (2-5)
CGN 4933 Special Topics in Civil and Environmental Engineering (1-5)
CGN 5933 Special Topics in Civil Engineering and Mechanics (1-5)
CWR 4103 Water Resources Engineering I (3)
CWR 4202 Hydraulics (3)
CWR 4545 Water Resources Engineering II (3)
CWR 4812 Capstone Water Resources/Environmental Design *MW* (3)
EMA 4324 Corrosion of Engineering Materials I (3)
EMA 5326 Corrosion Control (3)
ENV 4001 Environmental Engineering (3)
ENV 4101 Air Pollution Control (3)
ENV 4417 Water Quality and Treatment (3)
ENV 4432 Water Systems Design (2)
ENV 4502 Environmental Unit Operations (3)
ENV 4503 Environmental Unit Processes (3)
ENV 4552 Environmental Unit Operations and Processes (3)
ENV 5101 Solid Waste Engineering (2)
ENV 5105 Air Resource Management (3)
ENV 5334 Hazardous Waste Management and Remedial Action (3)
ENV 5345 Solid Waste Control (3)
SUR 2101C Engineering Land Surveying (3)
TTE 4004 Transportation Engineering I (3)
TTE 4005 Transportation Engineering II (3)
TTE 4821 Transportation Systems Design (2)
TTE 5205 Traffic Systems Engineering (3)
TTE 5501 Transportation Planning and Economics (3)

COMPUTER SCIENCE AND ENGINEERING

CAP 5400 Digital Image Processing (3)
CAP 5625 Introduction to Artificial Intelligence (3)
CAP 5682 Expert And Intelligent Systems (3)
CDA 3100 Computer Organization (3)
CDA 3201 Computer Logic and Design (3)
CDA 3201L Computer Logic Design Lab (1)
CDA 4100 Computer Organization and Architecture (3)
CDA 4203 Computer System Design (3)
CDA 4203L Computer System Design Lab (1)
CDA 4205 Computer Architecture (3)
CDA 5405 Modeling Computer System Performance I (3)
CDA 5406 Modeling Computer System Performance II (3)
CEN 4020 Software Engineering (3)
CEN 4022 Software Sytems Development (3)
CEN 4721 User Interface Design (3)
CGS 2060 SC Introduction to Computers and Programming in Basic *6A* (3)
CGS 2062 Computers And Society (3)
CGS 2260 SC Mini-Computer Applications (3)
CGS 3462 SC Pascal Programming (3)
CGS 3463 SC GPSS Simulation (3)
CGS 3464 SC Simscript Simulation (3)
CGS 5765 Introduction to Unix and C (3)
CIS 4250 Ethical Issues And Professional Conduct *6A MW* (3)
CIS 4900 Independent Study In Computer Science (1-5)
CIS 4910 Computer Science Project (2)
CIS 4930 Special Topics in Computer Science I (1-4)
COP 2000L Computer Science Laboratory (1)
COP 2002 Introduction to Computer Science (3)
COP 2120 SC Cobol Programming I (3)
COP 2121 SC Cobol Programming II (3)
COP 2200 SC Fortran Programming (3)
COP 2400 Computer Systems (3)
COP 2510 Programming Concepts (3)
COP 3514 Program Design (3)
COP 4020 Programming Languages (3)
COP 4023 Comparison Of Programming Languages (3)
COP 4600 Operating Systems (3)
COT 3100 Introduction to Discrete Structures (3)
COT 4210 Automata Theory and Formal Languages (3)
COT 4400 Analysis Of Algorithms (3)
EEL 4748 Microprocessor-Based System Design and Application (3)
EEL 4756 Signal and Image Processing (3)
EEL 4781C Distributed Processing and Computer Networks (3)
EEL 4851C Data Structures (3)
EEL 4852C Data Base Systems (3)
EEL 5771 Introduction to Computer Graphics I (3)
ETG 4931 Special Topics in Technology I (1-5)
ETG 4932 Special Topics in Technology II (1-5)
ETI 4666 Principles of Industrial Operations II (3)

ELECTRICAL ENGINEERING

EEL 2161 Electrical Engineering Computer Methods (3)
EEL 3100 Network Analysis and Design (3)
EEL 3302 Electronics I (3)
EEL 3410 Fields and Waves I (3)
EEL 4030 Electrical Systems Environments (3)
EEL 4102 Linear Systems Analysis (3)
EEL 4305 Electronics II (3)
EEL 4351C Semiconductor Devices (3)
EEL 4420 RF & Microwave Measurements (2-3)
EEL 4430 RF/Microwave Circuits I (3)
EEL 4431 RF/Microwave Circuits II (3)
EEL 4472 Electromagnetics (3)
EEL 4512C Communication Systems (3)
EEL 4567 Electro-Optics (3)
EEL 4657 Linear Control Systems (3)
EEL 4705 Logic Design (3)
EEL 4705L Logic Laboratory (1)
EEL 4743L Microprocessor Laboratory (1)
EEL 4744 Microprocessor Principles and Applications (3)
EEL 4905 Independent Study (1-5)
EEL 4906 Professional Issues and Engineering Design *MW* (2)
EEL 4935 Special Electrical Engineering Topics I (1-4)
EEL 4936 Special Electrical Engineering Topics II (1-4)
EEL 4937 Special Electrical Engineering Topics III (1-4)
EEL 5250 Power System Analysis (3)
EEL 5316 Wireless Circuits and System Design Laboratory (2)
EEL 5344C Digital CMOS/VLSI Design (3)
EEL 5356 Integrated Circuit Technology (3)
EEL 5357 Analog CMOS/VLSI Design (3)
EEL 5382 Physical Basis Of Microelectronics (3)
EEL 5437 Microwave Engineering (3)
EEL 5462 Antenna Theory (3)
EEL 5572C Local and Metropolitan Area Networks (3)
EEL 5631 Digital Control Systems (3)
EEL 5754C Microprocessor Based Digital Signal Processing (3)
EEL 5935 Special Electrical Engineering Topics I (1-3)
EEL 5936 Special Electrical Engineering Topics II (1-3)
EEL 5937 Special Electrical Engineering Topics III (1-3)
ELR 3301L EE Circuits Laboratory (1)
ELR 3302L EE Electronics Laboratory (1)
ELR 4316L Wireless Circuits & Systems Design Laboratory (2)

INDUSTRIAL AND MANAGEMENT SYSTEMS

EIN 4312C Work Analysis (3)
EIN 4313C Human Factors (3)
EIN 4333 Production Control (3)
EIN 4364C Facilities Design I (3)
EIN 4365 Facilities Design II *MW* (3)
EIN 4411 Manufacturing Processes (3)
EIN 4601L Automation and Robotics (3)
EIN 4933 Special Topics in Industrial Engineering (1-6)
EIN 5245 Work Physiology and Biomechanics (3)
EIN 5322 Principles of Engineering Management (3)
EIN 5357 Engineering Value Analysis (3)
EIN 5914 Special Industrial Projects I (1-3)
ESI 4221 Industrial Statistics and Quality Control (3)
ESI 4244 Design Of Experiments (3)
ESI 4312 Deterministic O. R. (3)
ESI 4523 Industrial Systems Simulation (3)
ESI 4905 Independent Study (1-5)
ESI 4911 Senior Project (2)
ESI 5219 Statistical Methods For Engineering Managers (3)
ESI 5236 Reliability Engineering (3)
ESI 5306 Operations Research For Engineering Management (3)
ESI 5470 Manufacturing Systems Analysis (3)
ESI 5522 Computer Simulation (3)

MECHANICAL ENGINEERING

EAS 4121 Hydro and Aerodynamics (3)
EML 3041 Computational Methods (4)
EML 3262 Kinematics and Dynamics of Machinery (3)
EML 3303 Mechanical Engineering Lab I (3)
EML 3500 Mechanics of Solids (3)
EML 3701 Fluid Systems (3)
EML 4031 Visual Basic for Engineers and Scientists (3)
EML 4106C Thermal Systems and Economics (3)
EML 4142C Heat Transfer I (3)
EML 4220C Vibrations (3)
EML 4302 Mechanical Engineering Laboratory II (3)
EML 4312 Mechanical Controls (3)
EML 4414 Heat Power Engineering (3)
EML 4419C Propulsion I (3)
EML 4501 Machine Design (3)
EML 4551 Capstone Design *MW* (3)
EML 4552 Senior Mechanical Design (3)
EML 4562 Introduction to Composite Materials (3)
EML 4601 Air Conditioning Design (3)
EML 4905 Independent Study (1-4)
EML 4930 Special Topics in Mechanical Engineering (1-4)
EML 5245 Tribology (3)
EML 5325 Mechanical Manufacturing Processes (3)
EML 5422 Internal Combustion Engines (3)
EML 5930 Special Topics III (1-4)
EML 5931 Special Topics IV (1-4)