Program Planning Summary

New Degree Program

Bachelor of Science in Engineering with a Major in Engineering Science
(CIP Code 141301)

Submitted by

University of South Carolina, Columbia

February 1,2008

Andrew Sorensen, President

New Undergraduate Degree Program in Engineering Science

This is a proposal for a new program offering the Bachelor of Science in Engineering degree with a major in Engineering Science at the University of South Carolina. The credit hours and degree requirements will conform to the standards of the University and the College of Engineering and Computing. The program will require a minimum of four full years of study and a maximum of 128 hours of earned credit.

Proposed Implementation Date

A Fall **2009** date of implementation is planned.

Justification

The University of South Carolina presently offers six discipline-specific undergraduate engineering degree programs: Biomedical Engineering, Chemical Engineering, Civil Engineering, Computer Engineering, Electrical Engineering, and Mechanical Engineering; and two undergraduate degree programs in computing: Computer Science and Computer Information Systems. An undergraduate Engineering Science program will provide a non discipline-specific engineering degree program; it is needed for two primary reasons:

1. it will enable students to engage in interdisciplinary studies combining learning outcomes and skills from several discipline-specific engineering programs; and
2. it will give students the flexibility needed to begin their studies in a graduate professional field such as law, business, medicine, or education, while completing their undergraduate engineering degree. This will effectively shorten the total time and reduce the expense of obtaining both degrees.

Many products in use today have features or are built with processes that combine elements of mechanical, electrical, computational, chemical, or structural engineering. For example a cell phone involves mechanical design, electrical design, the development of software, and the design of an elaborate communications system. Interdisciplinary and cross-functional teams are most often used in the design and development of such products and people with training in multiple disciplines are a major asset to such teams since they are better able to evaluate the cross-disciplinary tradeoffs involved in the design. A Bachelor of Science in Engineering with a major in Engineering Science degree will enable students to satisfy this need by taking courses and learning skills in several engineering disciplines.

Many students who earn undergraduate engineering degrees go on to earn graduate-level professional degrees in fields such as law, business, medicine, or education. The problem solving skills acquired in engineering provide a solid foundation for the student's studies and the work required in these professions. Patent attorneys for example, are required to have a technical undergraduate degree as well as a JD degree. However, earning both an undergraduate degree and a graduate professional degree is a lengthy and expensive undertaking often taking a total of six to ten years or more. The College of Engineering and Computing has some agreements in place and is presently seeking additional

agreements with other professional schools and colleges within the University of South Carolina to enable qualified engineering and computing students to begin work on a graduate professional degree while they complete their undergraduate engineering or computing degree. An Engineering Science degree will provide both the solid technical foundation such students need and also give the students the flexibility to attain this goal in a reduced amount of time. We believe that by judiciously choosing elective courses within the degree program a student will be able to shorten the total time required to earn both degrees by from one semester to a full year of study.

In their most recent employment outlook, "Occupational Employment Projections to 2016"[1], the US Bureau of Labor Statics projects a need for 505,000 new engineers in all disciplines for job openings due to growth and net replacements between 2006 and 2016; employment of engineers is projected to increase by 161,000 (1,512,000 in 2006 to 1,671,000 in 2016) representing 10.6% growth during the period. Similarly, the BLS projects a need for 1,524,000 new computer specialists and computing related jobs are expected to increase by 25.2%. Although their qualifications for these jobs will depend on their specific course of study, graduates with a major in Engineering Science will be looking for jobs in fields for which there is a strong and growing demand.

Anticipated Program Demand

We anticipate that approximately 25 new B.S. degrees will be granted annually after this program has become fully operational. We expect the program to be especially attractive to students in the South Carolina Honors College who have advanced placement credits and are interested in combining aspects of several discipline-specific programs or are planning to attend a graduate professional school. The undergraduate Engineering Science program will accept students who meet the entrance requirements of the University and the College of Engineering and Computing.

Duplication of Existing Programs in the State

There is presently only one small Engineering Science program (CIP 141301) in South Carolina at Bob Jones University. The SC Commission on Higher Education Inventory of Academic Programs also includes a general Engineering program (CIP code 14999) at Charleston Southern University. Neither of these programs is accredited by ABET and they are quite small. The College of Engineering program will be designed to meet the ABET Engineering Accreditation Commission requirements for Engineering Science programs and seek accreditation through ABET.

Relationship to Existing Programs at USC

The College of Engineering and Computing has five departments (Chemical Engineering, Civil and Environmental Engineering, Mechanical Engineering, Electrical Engineering,

[1] Arlene Dohm and Lynn Shniper, Occupational Employment Projections to **2016,** on-line at http://www.bls.gov/opub/mlr/2007/11/art5full.pdf, Appendix: Employment by Occupation, **2006** and projected **2016.**

and Computer Science and Engineering). The required and elective courses in the Engineering Science program will be taught by faculty members fiom these departments. The College has teaching strengths in all traditional areas of engineering and in some specialty areas including materials synthesis, testing, and characterization; experimental and computer imaging; sensors and optical devices; heat, mass, and fluid transport, bioinformatics, and nanotechnology. One faculty member has a BS degree in Engineering Science. In addition to the engineering and computing courses, the Engineering Science degree will require coursework fiom other undergraduate programs at USC, including English, Mathematics, and Physics.

The College is presently seeking to establish and expand agreements with other colleges within USC, including the Darla Moore School of Business, the College of Education, the School of Medicine, and the School of Law, to allow qualified engineering students to begin their graduate professional degree studies while completing their undergraduate studies. We expect this option to be especially attractive to students majoring in Engineering Science—in fact, facilitating this option is one reason for establishing the new degree program. The program curriculum will include elective courses specifically intended to allow students to take prerequisite and required courses, including some graduate-level courses, for these graduate professional degree programs.

The College of Engineering and Computing already has articulation agreements that allow students to begin their studies at one of the branch campuses of USC and then transfer credits obtained fiom those institutions to their degree requirements at USC. These agreements will also apply to the courses required for the Engineering Science degree.

Inter-Institutional Collaborations

The College of Engineering and Computing also has articulation agreements with many of the technical colleges in South Carolina that allow students to begin their studies at those institutions and transfer the credits to their degree requirements at USC. These agreements will also apply to the courses required for the Engineering Science degree. Students in the Engineering Science program will also be eligible to work on research projects and student projects that are jointly conducted with other universities within South Carolina, within the United States, and even internationally. The College of Engineering and Computing is presently developing several agreements of this type.

Estimated New Costs

The Engineering Science degree program will utilize the existing faculty, staff, equipment, and laboratories of the University and the College of Engineering and Computing and no new costs directly attributable to the program are anticipated.