

**New Program Proposal  
Bachelor of Science  
Environmental Engineering  
with a Concentration in Natural Systems  
Clemson University**

**Summary**

Clemson University requests approval to offer a program leading to the Bachelor of Science degree in Environmental Engineering with a concentration in Natural Systems, to be implemented Fall 2010. The program will be offered on the Clemson campus using traditional instruction methods.

The Program Planning Summary was submitted to the Commission on February 1, 2009, and reviewed and voted upon favorably without substantive comment by the Advisory Committee on Academic Programs (ACAP) on March 19, 2009. The Clemson University Board of Trustees approved the proposal on February 12, 2009. The full proposal was received by the Commission on May 1, 2009.

According to the proposal, the purpose of the proposed program is to provide graduates with a strong background in environmental engineering and related life-sciences, mathematics, and applied sciences. The proposal states that graduates from the proposed program will be prepared to enter careers in industry, government, consulting, and academia. The proposal also states that in addition to the direct career paths available, graduates will be prepared for graduate school in environmental engineering programs and related disciplines. Clemson and USC both offer master's-level programs in environmental engineering, and Clemson offers a doctoral-level program. There is currently no baccalaureate-level program in environmental engineering in South Carolina.

The proposal cites Bureau of Labor Statistics (BLS) indicating that there are over 54,000 environmental engineers employed in the nation, more than the combined total for material and chemical engineering. Staff research of BLS data indicates that the B.S. degree is the entry-level degree for the environmental engineering profession, although according to the proposal many industries consider the M.S degree to be necessary. The BLS also indicates that a B.S. degree in environmental engineering is helpful for students who might wish to continue into related areas such as environmental law. According to the proposal and BLS data, employment in environmental engineering occupations is growing "much faster than average." The proposal states that this increase in environmental engineering positions, predicted to reach 25% by 2016, is fueled by increased interest in the area and the replacement of retiring workers in the field.

Clemson states that it currently has related concentrations (Natural Resources and Environment (NRE) and Applied Biotechnology) in the Biosystems Engineering program offered by the Department of Agricultural and Biosciences Engineering (ABE). The proposal states that the NRE concentration will be renamed Natural Systems and moved to the proposed program, which will be jointly offered by the ABE and Environmental Engineering and Earth Sciences (EEES departments).

Based on BLS figures showing an increasing interest in the area of environmental engineering, Clemson predicts a total of ten new students (10.7 FTE), rising in the first five years by five additional new students a year to 30 new students (32 FTE) in the fifth year of implementation. Total program enrollment, including transfers from other departments and the transfer of students in the Natural Systems concentration to the proposed program, is projected to reach 90 students (96.8 FTE) by the fifth year of implementation. If enrollment and program completion projections are met, the proposed program will meet the Commission's productivity standards.

Clemson University states that it has on-going articulation agreements with the state's technical colleges for students wishing to enter engineering programs. These agreements will apply to the proposed program.

Admission requirements for the proposed program will be consistent with those for acceptance into other engineering programs at Clemson. The curriculum for the proposed program in Environmental Engineering will consist of a total of 128 credit hours. The proposal states that the freshman and sophomore years' curriculum will be common to all students in the program, and that considerable specialization will occur in different areas of environmental engineering as students enter their junior year. The proposed curriculum will require four new courses (Environmental Engineering Fundamentals I, Environmental Engineering Fundamentals II, Professional Seminar, and Capstone Design Project) for a total of ten credit hours to be added to Clemson's catalog.

The proposed program's assessment plan has four components designed to assess the different aspects of the program's curriculum. Three of these components (engineering, oral and written communication, and academic and professional development) are based on ABET requirements for accredited programs. The fourth component, general education, uses Clemson's existing assessment methods to determine student progress.

According to the proposal, the proposed program will use existing faculty currently teaching the elective upper-level courses used for the program. Based on anticipated student enrollment and course-taking patterns, these 17 faculty members will devote .13 FTE to the proposed program in the first year of implementation, increasing to .31 FTE in the second year, 1.03 FTE in the third, 2.5 FTE in the fourth, and further

increasing to 2.75 FTE in the fifth year of implementation. The proposal states that there will be no new administration or staff personnel required for the implementation of the proposed program.

The proposal states that there is sufficient class space to support the four new courses required by the proposed program, and that no new space or facilities are needed. The proposal also notes that existing instructional equipment will be sufficient for the proposed program, but that some additional equipment will be desirable, although not necessary, in the future.

According to the proposal, the program will not require additional library resources. The proposal states that the Clemson library supports teaching and research in all subject areas covered by the proposed program and that student electronic access to on-line journals related to environmental engineering, supported by the Partnership Among South Carolina Academic Libraries (PASCAL), significantly increases broad access to materials. Clemson's library holdings already support an ABET-accredited program leading to the M.S. degree in Environmental Engineering and Science. ABET does not accredit Ph.D. programs.

The proposal states that the proposed curriculum has been developed in keeping with ABET accreditation requirements. Clemson's Department of Agricultural and Biosciences Engineering (ABE) and Department of Environmental Engineering and Earth Sciences (EEES) are ABET-accredited. The proposed program will seek accreditation after the first class of students graduates. Graduates of the proposed program will be eligible for licensure as Professional Engineers.

New costs for the proposed program are estimated to begin at \$12,000 in the first year and include supplies and materials (\$10,000) and other (\$2,000). The proposal states that "other" costs include various expenses related to student recruitment and student field trips required for the proposed program. Estimated new costs increase to \$40,000 in the second year, further increase to \$41,000 in the third year, then increase to \$64,000 in the fourth year and \$66,000 in the fifth year. Total estimated new costs for the program for its first five years are \$223,000 and include graduate assistantships (\$131,000), supplies and materials (\$50,000), and other (\$42,000).

Shown below are the estimated Mission Resource Requirement (MRR) costs to the state and new costs not funded by the MRR associated with the implementation of the proposed program for its first five years. Also shown are the estimated revenues projected under the MRR and the Resource Allocation Plan as well as student tuition.

**Estimated Program Costs and Revenue**

	Estimated Program Costs		Estimated Program Revenue				(G) Total Revenue - Total Costs (F-(A+B))
	(A) MRR Cost	(B) Other Costs*	(C) Actual State Funding	(D) Tuition	(E) Additional Revenue	(F) Total Revenue (C+D+E)	
<b>Year 1</b>	\$133,963	\$0	N/A	\$144,902	\$0	\$144,902	\$10,939
<b>Year 2</b>	\$200,944	\$0	\$71,616	\$216,834	\$0	\$288,450	\$87,506
<b>Year 3</b>	\$267,925	\$0	\$106,983	\$287,464	\$0	\$394,446	\$126,521
<b>Year 4</b>	\$334,907	\$0	\$143,233	\$359,396	\$0	\$502,628	\$167,722
<b>Year 5</b>	\$401,888	\$0	\$178,599	\$432,365	\$0	\$610,964	\$209,076

\*Includes costs of an extraordinary nature not otherwise included in the MRR cost calculation (e.g., costs for a new building required to support a program).

The data shown in the MRR table demonstrate that if the institution meets the projected student enrollments and contains costs as they are shown in the proposal, the program will be able to cover costs beginning in the first year and thereafter.

In summary, Clemson University is proposing a new program leading to the Bachelor of Science degree in Environmental Engineering, to be implemented in Fall 2010. The proposed program will be offered jointly through the Departments of Agricultural and Biosciences Engineering and Environmental Engineering and Earth Sciences and will draw students from both departments. The proposed program will prepare graduates for further education and employment in various environmental engineering-related occupations.

**Recommendation**

The Committee on Academic Affairs and Licensing commends favorably to the Commission the program leading to the Bachelor of Science degree in Environmental Engineering with a concentration in Natural Systems at Clemson, to be implemented in Fall 2010, provided that no “unique cost” or other special state funding be required or requested.