New Program Proposal
M.S. in Biotechnology
Clemson University

Summary

Clemson University requests approval to offer programs leading to the Master of Science degree in Biotechnology, to be implemented in Fall 2008.

The proposal was approved by the Clemson Board of Trustees on October 22, 2004, and submitted for Commission review on November 14, 2006. The proposal was reviewed with voted upon favorably by the Advisory Committee on Academic Programs at its meeting on January 17, 2007.

According to the proposal, the purpose of the program is to prepare graduates to meet the growing demand of the biotechnology industry for qualified research associates and to complement Clemson's Ph.D. and M.S. degrees in Bioengineering. The need for the program is owed to the requirement for graduates in this field, if South Carolina's biotechnology sector is to grow. This program, unlike the M.S. and Ph.D. in Bioengineering is focused on entry into industry. Accordingly, it will prepare students in industry-oriented, molecular techniques; laboratory skills; bioprocessing; and good manufacturing practices as they relate to biotechnology.

The program will supply the growing biotechnology sector of the economy with graduates to develop Biotechnology has been a prolific source of drugs, medical devices, forensic techniques, and new crops that are resistant to herbicides and pest insects. The biotechnology industry will be one of the economic growth engines of the coming decades. The CEO of South Carolina Biotechnology Incubator (SC BIO) states that the biotechnology industry in South Carolina will have an estimated fiscal impact of $150 million by 2018. The sector could employ 20,000 South Carolinians directly and 60,000 directly or indirectly.

Nationally, comparable programs which are similar in content may be found at the University of Nevada-Reno and University of Maryland- Baltimore. Within South Carolina, USC-Columbia Professional Master's degree in Biotechnology and Claflin University's Master's degree in Biotechnology are similar programs. Claflin University has an undergraduate degree in Biotechnology that is perceived as a feeder to this proposed program.

Students may be admitted into the degree program either as graduates of an accredited undergraduate degree or, while still undergraduate in comparable fields, to apply for the program as part of a combinational "five years and a summer" model to receive both the B.S. and M.S. at the conclusion of the studies. The formal admission process is required.

The proposal estimates that there will be 30 headcount (0.4 FTE) students in the first year, 75 (2.8) FTE in the second, 105 (5.0) in the third, 120 (6.1 FTE) in the fourth, and 120 (7.5) in the fifth. The proposed program will mainly attract Clemson students who work in the biotechnology industry, students presently in the Life Sciences Department, and students form other universities. If enrollment projections are met, the program will meet the Commission's program productivity standards for enrollment and degrees awarded.

The proposed program will consist of 30 graduate semester hours, including: 20 semester hours in core Biotechnology, Biochemistry, Genetics Molecular Biology, and Research core courses; six to nine semester hours in either the required courses for Molecular Biology or Bioprocessing; and remaining hours in elective courses.

The proposed program draws from coursework and faculty already at the institutions. Faculty will be drawn from the Department of Genetics and Biochemistry, Life Sciences Studies, and Biosytems Engineering, a program in the College of Agricultural and Biological Engineering.

The proposal notes that the addition of 1 (0.7 FTE) faculty member in the first year of the proposed program and two adjunct faculty members (0.2 FTE) in the second year. The proposal also notes the addition of one program administrator in the first year who will be 30% administration and 70% teaching in the program.

There are no new physical plant requirements associated with the proposed programs, although existing space may be reallocated when new space becomes available in the future Clemson Biomanufacturing Facility. There will be new equipment required to support the proposed programs. The total first-year cost will be approximately $50,000. The budget reflects continuing costs of approximately $10,000 per year for the next four years.

The proposal notes that the current library is more than sufficient to support program needs. The *ALA Standards for College Libraries* does not provide specific standards for biotechnology. However, a search of the library's holdings discloses 705 book titles under the general heading of "Biotechnology"; 218 of these titles were published in the last five years. The library also subscribe to

15,000 journals and has a growing list of "e-journals" though PASCAL and an effective Interlibrary Loan program through PASCAL to acquire books and journals not on its list.

Categories of costs over the first five years of the program's implementation include faculty salaries ($225,000); program administrator ($75,000); graduate assistants ($200,000); supplies and materials ($50,000); and equipment ($90,000). New costs for the program are estimated to begin at $160,000 in the first year, decreasing to $120,000 in the second year, then increasing to $152,960 in the third year, $191,000 in the fourth year, and to $229,440 in the fifth year. Total estimated new costs for the program during the first five years will be $640,000.

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

Year	Estimated MRR Cost for Proposed Program	Extraordinary (Non-MRR) Costs for Proposed Program	Total Costs	State Appropriation	Tuition	Total Revenue
Year 1	$8,376	$0	**$8,376**	N/A	$2,786	**$2,786**
Year 2	$62,357	$0	**$62,357**	$2,952	$28,768	**$31,720**
Year 3	$110,754	$0	**$110,754**	$25,889	$51,964	**$77,853**
Year 4	$135,883	$0	**$135,883**	$45,874	$63,101	**$108,976**
Year 5	$167,528	$0	**$167,528**	$56,144	$77,947	**$134,090**

These data demonstrate that if the institution meets the projected student enrollments and contains costs as they are shown in the proposal, the program leading to a M.S. degree in Biotechnology will not be able to cover costs during

each of its first five years. Nevertheless, the institution indicates it has the revenues necessary to implement the program with quality.

In summary, Clemson University has proposed a program leading to the Master of Science in Biotechnology. The proposed program will prepare graduates to meet the growing demand of the biotechnology industry for qualified research associates and to complement Clemson's Ph.D. and M.S. degrees in Bioengineering. The program will be important for the biotechnology industry which must have competent technical staff who can profitably manufacture drugs and other biotechnology products.

Recommendation

The Committee on Academic Affairs and Licensing recommends that the Commission approve Clemson University's proposed program leading to the Master of Science degree with a major in Biotechnology, to be implemented in Fall 2008, provided that no "unique cost" or other special state funding be required or requested.