

ACADEMIC AND STUDENT AFFAIRS COMMITTEE

October 17, 2006

SUBJECT: Approval of New Degree: Master of Science in Bioengineering (14.0501)

PROPOSED COMMITTEE ACTION

Approval of New Masters Degree in Bioengineering

BACKGROUND INFORMATION

The Master of Science degree in Bioengineering at FAU will prepare students for professional careers in businesses related to medical diagnostics, prosthetic devices, and neural and other implants; the pharmaceutical and biotechnology industries; and consulting in health-related fields, as well as other positions in industry, commerce, education and government. Students will be prepared to continue their formal education at the Ph.D. level in a variety of science and engineering disciplines and at the MD level in certain cases. This new degree program responds to the State of Florida and national workforce needs of industries, hospitals, and agencies comprising the Pharmaceutical, Biotechnology, and Healthcare sectors of the economy.

Bioengineering is a broad field at the intersections of engineering and the life sciences. Our interpretation of the emerging field of Bioengineering takes several disciplines - Biomedical Engineering, including Biomechanics; Neuroscience; Biotechnology; and Bioinformatics, and forges a unique entity. Bioengineers will likely interact with professionals whose training varies widely and must, therefore, exercise fundamental understanding and depth and breadth of specialized knowledge throughout their careers. Faculty members that teach courses and supervise graduate research assistants will be drawn from departments and centers in a number of colleges.

IMPLEMENTATION PLAN/DATE

Spring 2007

FISCAL IMPLICATIONS

Few additional facilities or resources are requested to initiate the proposed program.

Supporting Documentation:
Presented by: Deans Karl Stevens, Gary Perry

Executive Summary of Degree
Phone: 561.297.2011

FLORIDA ATLANTIC UNIVERSITY™

College of Engineering & Computer Science

Department of Electrical Engineering

New Degree Proposal

Master of Science in Bioengineering

Dr. Karl K. Stevens, Dean

Dr. Salvatore D. Morgera, Chair & Program Director

Program Vision

To improve health and quality of life by applying engineering principles to scientific discovery and technology innovation and to train future leaders in Bioengineering through inspiring education, dedicated mentorship, and basic and applied research in an environment free of the traditional boundaries among disciplines.

Executive Summary

Bioengineering stands at the intersection of the revolution taking place in advanced medical treatments as a result of applying the principles and practice of the engineering and computer science disciplines to the biological, biomedical, and medical sciences. Bioengineering is a broad and emerging field that impacts drug delivery, surgery, diagnosis, prevention, and treatment. The Master of Science in Bioengineering degree program will strengthen the Florida workforce in terms of employment, retention, increased earnings, and enhanced occupational skills. This academic program and its related research component and many partners will, together, significantly contribute to State of Florida productivity and competitiveness. This program specifically supports common FAU/SUS Strategic Priorities 1 and 3, meeting statewide professional and workforce needs and building world-class academic programs and research capacity, respectively.

Students successfully completing the Master of Science in Bioengineering degree program will be prepared for professional careers in businesses related to medical diagnostics, prosthetic devices, and neural and other implants; the pharmaceutical and biotechnology industries; and consulting in health-related fields, as well as other positions in industry, commerce, education, and government. Students will also be prepared to continue their formal education at the Ph.D. level in a variety of science and engineering disciplines and at the MD level in certain cases. These outcomes are not simply predictions of what we would like to see happen. These outcomes are based on experience with the highly successful FAU Bioengineering Graduate Certificate Program that has been in place since Fall 2003 and currently has 67 students pursuing 15 credits of selected science and engineering coursework.

The proposed Master of Science in Bioengineering degree program is distinctive within the Florida SUS, possibly due to the fact that planning and implementing such a program is extremely difficult without the support and cooperation of both the Colleges of Science and Engineering, a situation which we enjoy at FAU. Admission requirements for students include a Baccalaureate degree in Biology, Chemistry, Physics, Computer Science, or Engineering with a

mathematics background through differential equations; at least a 3.0 (of a 4.0 maximum) grade point average (GPA) in Science, Mathematics, and Engineering courses; and a combined score of 1000 or higher on the verbal and quantitative portions of the Graduate Record Examination (GRE). Once admitted into the program, a student may pursue either a 30 credit thesis option (24 credits of coursework and 6 research thesis credits) or a 33 credit non-thesis option (30 credits of coursework and 3 research project credits). In either option, a required 9 credits of coursework constitutes the program core.

All core courses are currently offered at a frequency sufficient to meet student requirements and have had their content refined through the Bioengineering Graduate Certificate Program assessment and continuous improvement processes over a period of three years. A tremendous strength of the proposed program is that it takes advantage of many of the courses, both core and elective, already offered in several departments in the College of Engineering and Computer Science, Charles E. Schmidt College of Science, and Christine E. Lynn College of Nursing. At this time, a student can choose from a list of over 36 elective courses offered by 8 departments in 3 colleges. This adds considerable value to the program by providing continuity of the program with other disciplines in these colleges, as well as involvement and exposure of students to faculty from across these colleges.

The implementation plan for the Master of Science degree in Bioengineering program has two phases. This plan reflects the reality of resource availability. In the first phase, students will take program core courses and then select their remaining course credits from a list of electives indicative of the broad expertise in Bioengineering and Bioengineering related areas currently found in the various departments and centers of the College of Engineering and Computer Science, Charles E. Schmidt College of Science, and the Christine E. Lynn College of Nursing. In effect, early students of the program will be following what we refer to as a General Bioengineering Studies Track. This first phase will continue for a period of several years and will allow time for new faculty with research and teaching interests in Bioengineering areas to be hired and for current faculty to develop new courses and laboratories. At this time, an unprecedented 25 existing faculty members in the College of Engineering and Computer Science have agreed to participate in the program in various ways, devoting approximately 4-5 person-years to the program. Supplementing this effort is a number of highly distinguished adjunct faculty members who are physicians, surgeons, and industry leaders.

As the Bioengineering Program develops and more courses are added to the curriculum, the program will enter the second phase in which students will take program core courses, select a program track, and then select the majority of their remaining course credits from a list of track electives. The following program tracks for the later phase of the program are envisioned:

- Biomedical and Biosystems Engineering
- Bioinformatics Engineering and Computer Science
- Biotechnology Robotics and Automation
- Biomechanics
- Neuroscience and Neurosurgical Engineering
- General Bioengineering Studies

The ultimate program goal is one that stresses both breadth and flexibility (students are required to satisfy program core requirements and are allowed to choose a track and electives in accord with their needs and interests) and depth (students are required to follow a track and complete a MS thesis or fully document a research project).

It is the intention that the program offer exceptional opportunities for practical training (through COOP/internship in industry, clinical, or hospital settings) and for exposure to the business aspects of the Bioengineering industrial sector, which differ considerably from those of other engineering industrial sectors. Opportunities for graduate students to conduct research in centers, institutes, and facilities with which faculty have association, College of Engineering & Computer Science Applied Stochastics Research, Imaging Technology, and Ocean & Systems Engineering Centers; Charles E. Schmidt College of Science Centers for Complex Systems & Brain Sciences and Molecular Biology & Biotechnology; Scripps Florida; Burnham Institute; Torrey Pines; Beckman Coulter Inc.; Northwest Medical Center; North Broward Medical Center; Miami Children's Hospital, Brain Institute & Neuroscience Center; and Good Samaritan Hospital, BioMotion Laboratory. A number of opportunities also exist for students in small, highly specialized companies.

We ask that the Master of Science in Bioengineering degree program be initiated in Spring 2007. The program will initially be offered on the Boca Raton Campus; however, the program will make extensive use of video conferencing and classroom management software to allow many core and elective courses to be delivered on other FAU campuses. Emphasis will be initially placed on delivery of the courses to the Jupiter Campus, due to the proximity of Scripps Florida and the interest of several Scripps faculty members to participate in the program and the fact that the FAU Honors College will serve as one important feeder for the program. There are no existing FAU academic programs that would be adversely affected by the proposed program and many existing programs that will complement the proposed program and be enriched by it.

In summary, the Master of Science in Bioengineering degree program is a distinctive program for FAU and the SUS which supports common FAU and SUS Strategic Priorities, contributes to the BOG targeted program accountability performance, and serves Florida's workforce needs in this dawn of a more diversified Florida economy. This program will attract new students to FAU. It will be initiated by reallocation of current resources and grown in a measured manner. The letters of external support for this program are many, and we anticipate continued strong interest in the program from both students and receptor institutions and industries.