Proceedings of the Second Joint EMBS/BMES Conference
Houston, TX, USA • October 23-26, 2002

AN ACCELERATED 4-YEAR BACHELORS/MASTERS DEGREE PROGRAM IN BIOMEDICAL ENGINEERING

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Abstract - **In response to the need for providing advanced engineering education in a shorter time period than is currently possible by traditional curricula, we have created an Accelerated Dual Degree program in biomedical engineering. The purpose of this pilot program is to attract the brightest students, get them involved in a research project at an early stage, and provide them with an intensive four-year educational program built around a cohort environment. Upon completion of the program, the students will receive a BS degree in biomedical engineering and an MS degree in bioengineering.**

Keywords - **Bachelors, Masters, biomedical engineering, education**

I. INTRODUCTION

The Accelerated Dual Degree (ADD) program in biomedical engineering at the University of Utah is a new, highly selective program that allows well-prepared and motivated students to obtain basic and advanced training in biomedical engineering within a time period that traditional programs require to obtain just a Bachelor of Science (BS) degree. The impetus for developing this program was a perceived need to provide more advanced engineering education than is provided by a BS degree, but to do so in a shorter time period than is normally required to obtain both a Bachelor's and a Master's degree in an engineering discipline.

The solution we arrived at was to create an accelerated educational track designed to attract bright students, involve them in a research project at an early stage, and provide an intensive educational experience built around a cohort environment. The anticipated result is that the students will receive dual BS and MS degrees in biomedical engineering in four years, which will prepare them for leadership positions in industry and/or study in graduate and professional schools. Upon entering the program, each student joins a cohort with other students at the same level in the ADD program, gets involved in exciting research early in her or his academic career (end of the sophomore year), and obtains a dual BS/MS degree in approximately four years of University studies. ADD students receive a stipend each year (progressing from $1000/yr to $6000/yr) with satisfactory progress.

II. CANDIDATES

The program is selective. It is intended for students with exceptional abilities (high grade point averages and ACT/SAT scores) and an interest in obtaining advanced training in biomedical engineering. To qualify, the students must be well prepared (i.e., they must have Advanced Placement (AP) credits in math, biology, chemistry and/or physics).

Qualified students are admitted to the program at the beginning of their university studies. Admission to the program is based on: grades achieved in high school classes, with particular emphasis on science and math courses; Advanced Placement and SAT or ACT scores achieved in high school; letters of recommendation from teachers; and commitment to the program, as evidenced by an interview (in person or by telephone). Promising students who have already begun the initial stages of their university training are considered in the same group as graduating high school students, but the program of study is modified to reflect university courses already taken.

In order to provide a complete Master's level educational experience in four years, students admitted to program are presumed to come from high school with AP credit in calculus and chemistry, which saves 18 hours of the typical engineering curriculum. Any student who is not in this position must take remedial courses during the summer preceding formal entrance to the university.

III. OUTLINE OF PROGRAM

The program is structured around a cohort system. Students admitted in a given year meet together once a week in a seminar format, beginning in their sophomore year. This gives a sense of belonging to the students, avoids the lost time that often occurs when a student is unsure about major requirements and scheduling, and allows the mentor to put the students on track for selecting a MS thesis project by the end of their sophomore year.

To meet credit hour requirements, each student takes a comprehensive series of courses for four years, including two Fundamentals of Bioengineering classes during the first year, as well as additional coursework from Bioengineering and other departments. The advanced coursework is tailored to the individual student's area of interest. In order to complete the required classes within four years, each student is expected to take general education courses and other electives required for the Bachelor's degree during summer sessions between Year 2 and 3, and between Year 3 and 4. This way undergraduate coursework is completed by the end of the third year, allowing graduate coursework to be completed in the last year of the program

Work on an individual Master's thesis project begins in the student's sophomore year (Year 2). The project provides a framework upon which to guide and motivate the student in his or her classroom activities and in the selection of elective courses. The Master's thesis project supercedes the normally required senior project. By getting started early,

the initial learning stages common to any research project are completed during the undergraduate phase of the program, allowing more efficient use of research time in Year 4. Examples of potential topics for research projects are presented by faculty members and representatives of local bioengineering industry during the first semester of the cohort seminar in Year 2. The student visits other potential thesis advisors during the fall semester, chooses a topic prior to the spring semester, and begins working with thesis advisor on a regular basis during the spring semester of Year 2.

Each student makes periodic reports of her or his research progress by means of written and oral reports in the cohort course and selects, in consultation with the research advisor, a standard three-person Graduate Supervisory Committee before the beginning of Year 4. The requirements for the Master's thesis in terms of quality and format are identical to that required of traditional Master's candidates.

When put together, the separate university requirements for the BS degree (122 semester hours) and the MS degree (30 graduate semester hours, including 6-10 thesis hours) are both met under this program. By providing a curriculum that is specialized to the interests of the student, several departments throughout the college are involved in providing engineering breadth as well as bioengineering depth to the student.

We began the program in fall 2001 with six students who are now in their first year. We will admit more students in spring 2002 for entrance in fall 2002. A flow diagram of the program is given in Table I.

TABLE I - FLOW DIAGRAM OF OVERALL ADD PROGRAM