BACKGROUND AND REQUEST

CLEVELAND STATE UNIVERSITY
Master of Science in Biomedical Engineering

RECOMMENDATION:

This program clearly meets the Chancellor's standards for graduate degree programs. The Regents' Advisory Committee on Graduate Study recently voted unanimous approval for the new degree program. There were no serious concerns raised in the review.

Request: Cleveland State University's Department of Chemical and Biomedical Engineering (ChBME) at the Fenn College of Engineering requests approval of the new Master of Science in Biomedical Engineering degree program.

Program Mission and Background: The proposed program of graduate study leads to the Master of Science in Biomedical Engineering (MSBME) and is intended for both those seeking master's degrees followed by employment in the biomedical industry, as well as those planning to continue doctoral studies in biomedical engineering. Interest in biomedical engineering has been increasing over the past five years among Cleveland State University's current bachelor's degree population, as well as among prospective students to the graduate engineering programs. This increase in interest parallels national enrollment trends in engineering.

Graduates of the proposed MSBME program will be able to obtain positions in product design, project management, research, engineering services, technical support and sales.

Enrollments: Anticipated enrollment will at least equal current enrollment in the chemical engineering master's program (MSChE), which has averaged 13 new students per year over the past five years. With a strong link to the Cleveland Clinic and the unique nature of this program centering on medical device design, it is anticipated that MSBME enrollment will surpass current MSChE enrollment. A conservative estimate of steady state enrollment (enrollment that does not change in time, or only negligibly over a specified time) in MSBME is about 26 students. Of these, at least half will be foreign nationals. The other half is expected to be Ohio resident students who have bachelor's degrees in chemistry, physics or biology and who want to move into an engineering career. This group of Ohio resident students will be a mix of full-time students continuing directly from their bachelor's program and part-time students who are employed in local industry, with full-time students most likely making up the majority of students. Cleveland State University has numerous programs aimed at recruiting and retaining minority students to STEM (science, technology, engineering and math) programs, and encouraging them to continue through graduate school. The university's graduate enrollment is 18% minority, and the Fenn College of Engineering's graduate enrollment is 6% minority, as of the 2007-08 academic year.

Curriculum: The minimum number of credits required for the proposed master's program is 30 hours. The program has a core set of courses for the purpose of building

the necessary foundation in physiology, cell and tissue biology, and biomedical signals. Students will select one of two tracks based on their needs—a traditional research Thesis Track or a Design Track. The Thesis Track is for the student who wants extensive research experience and a focus within a particular field. This option will allow a pathway for students to transition from bachelor's degrees in engineering or the life sciences to the existing Applied Biomedical Engineering (ABE) specialization within the Doctor of Engineering program. The Design Track is for the student who wants to apply engineering skills to the design of a biomedical process or product that may have direct benefit to health-care and/or the health-care industry. This option is especially appropriate for those who will seek industrial employment directly after completing the master's program and/or are interested in starting their own business. The emphasis on biomedical product design and the year-long design project conducted with mentors from local industry and research institutes will make the program unique in Ohio.

Faculty, Facilities and Resources: The MSBME program will be administered by the ChBME Department. A director for the MSBME program will be named, from one of the ChBME Department faculty members. The ChBME Department has nine full-time tenured or tenure-track faculty members. Six of the nine faculty members have expertise in the fields of biomedical engineering, tissue engineering, cardiovascular imaging, blood flow, biologically-inspired materials, biosystem modeling, metabolic modeling, biomaterials, and data rectification. Students in the design track may do their design work in either the ChBME Department labs at Cleveland State University, at the Cleveland Clinic, or at the company that is mentoring their project. The ChBME Department has lab space and instrumentation available for students to build and test the medical devices. Students in the thesis track will perform their research either at Cleveland State University or at the Cleveland Clinic. The research labs at CSU are well equipped with equipment and instrumentation. The Engineering College brings in about $5M annually in research. Some of the students pursuing the thesis track will receive financial support from the research grants of their faculty research advisors, who may be full-time CSU faculty or adjunct faculty from the Cleveland Clinic. Library resources are available through the CSU library and the nearby libraries at the Cleveland Clinic, Case Western Reserve University and OhioLINK.

Evidence of Need: The proposed Master of Science in Biomedical Engineering program is unique in northern Ohio. It responds to the growing interest among students in the field of biomedical engineering, and is directly in-line with the university's distinctive mission to support the region's growing health-care and biomedical economy. Existing MSBME programs in northeast Ohio (University of Akron and Case Western Reserve University) have a traditional structure with an emphasis on research. While the thesis track of the proposed program is similar to these two programs, it fulfills an important need. The Bureau of Labor Statistics (BLS) indicates that over half of the biomedical engineers employed in the State of Ohio are in northeast Ohio. The median salary of biomedical engineers in the U.S. is $78,030. The BLS predicts that from 2004-2014, biomedical engineers will be in the top 30 of the fastest growing occupations and predicts employment to increase 31% during this time. The proposed MSBME program will provide a bridge for students from various engineering and scientific fields to enter the Applied Biomedical Engineering (ABE) program.

The proposed Master of Science in Biomedical Engineering program is directly in line with the University's distinctive missions to support the region's growing health-care and biomedical economy and to promote civic engagement.

End of Comment Period: July 9, 2009
No Comments Received, Recommend Approval

Approved	
Eric D. Fingerhut, Chancellor	7/24/09 Date

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