

Request for Authorization to Establish a Master of Science in Bioengineering at NC A&T State University

NC A&T State University requests authorization to establish a Master of Science in Bioengineering degree (CIP 14.0501).

Program Description

NCA&T, in partnership with the University of Pittsburgh and the University of Cincinnati, has been awarded a National Science Foundation (NSF) Engineering Research Center (ERC) on metallic biomaterials. In addition to the Bachelor of Science degree that is proposed to be established in conjunction with this initiative, a Master of Science degree is proposed. The MS degree will emphasize advanced study in two specialization areas: biomaterials and biomechanics; and bioimaging, biosignals, and biosensors. The program provides graduate level education designed to prepare the graduate for Ph.D. studies or for advanced bioengineering practice in industry, consulting, or government service.

UNC Tomorrow Relevance

This degree program addresses several recommendations in the UNC Tomorrow Final Report including 4.1 Our Global Readiness, 4.4 Our Communities and Their Economic Transformation, 4.5 Our Health, and 4.7 Our University's Outreach and Engagement.

Highlights from UNC-GA Data Template

Job growth in this field will be much faster than the national average for occupations. Over the last 10 years, bioengineering has been the fastest growing discipline in engineering. Average salaries are substantially higher than the overall state average. In the last three years, NCA&T has added one baccalaureate, one master's, and one doctoral program and has discontinued four baccalaureate and three master's programs.

Outcome of Consultation with Disciplinary Panel

Faculty from ECU, NCSU, UNC-CH, and UNCC participated in the panel discussion with NCA&T and UNC-GA representatives. Topics covered included: courses that the NCA&TSU program could share with the programs at NCSU and UNC-CH, the program's enrollment projections (overly optimistic?), the lack of a non-thesis option, and the status of faculty hires for the Engineering Research Center grant. Panel participants were supportive of the proposed degree.

Student Demand

Over the last ten years, bioengineering has been the fastest growing discipline in engineering. The program projects full enrollment of the program in its fourth year will

be 25 full-time students, although approximately 10 of them would have been otherwise enrolled in another NCA&T engineering program.

Opportunities for Graduates of the Program

Bioengineers are expected to have 21 percent employment growth over the decade. The aging of the population and the focus on health issues will drive demand for better medical devices and equipment designed by bioengineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for bioengineers, particularly in the pharmaceutical manufacturing and related industries.

Resource Implications

Resource needs: Over a period of several years, ten new faculty positions will be needed to support growth in the baccalaureate, master's, and doctoral programs.

Resources allocated: Funds for the above positions have been allocated by the University. The Engineering Research Center grant will bring direct federal funding of about \$40 million over 10 years. NCA&T has established a variety of state-of-the-art facilities including high performance computing systems, a scientific visualization laboratory, the Center for Advanced Materials and Smart Structures, and a number of other laboratories and facilities.

Estimated cost to the State: Based on the University funding formula, when the program reaches full enrollment, NCA&TSU would receive additional State appropriations of approximately \$687,519 if fully funded by the General Assembly.

Recommendation

It is recommended that the Board of Governors approve NCA&TSU's request to establish a Master of Science in Bioengineering degree (CIP 14.0501) subject to the availability of funding.

General Information Template for Academic Program Review

Degree Area and Level:

MS in Bioengineering (CIP 14.0501) at NCA&T

Addressing UNC Tomorrow:

This proposed program would address several Recommendations within the UNC Tomorrow Report including the components to enhance Our Global Readiness (Recommendation 4.1), Our Communities and Their Economic Transformation (Recommendation 4.4), Our Health (Recommendation 4.5), Our University's Outreach and Engagement (Recommendation 4.7).

Role of Program in Relation to State and Regional Needs:

According to the proposal this degree program, "responds to the need for biomedical engineering graduates. Over the last ten years, biomedical engineering has been the fastest growing discipline in engineering. Enrollment data from the American Association of Engineering Societies clearly shows that the undergraduate and graduate enrollment in biomedical engineering program in the United States has tripled in the last ten years, compared to a relatively negligible growth in cumulative enrollment in other engineering disciplines."

US Labor Department Analysis:

- *Summary* –Biomedical engineers are expected to have 21 percent employment growth over the projections decade, much faster than the average for all occupations. The aging of the population and the focus on health issues will drive demand for better medical devices and equipment designed by biomedical engineers. Along with the demand for more sophisticated medical equipment and procedures, an increased concern for cost-effectiveness will boost demand for biomedical engineers, particularly in pharmaceutical manufacturing and related industries. However, because of the growing interest in this field, the number of degrees granted in biomedical engineering has increased greatly. Biomedical engineers, particularly those with only a bachelor's degree, may face competition for jobs. Unlike many other engineering specialties, a graduate degree is recommended or required for many entry-level jobs.

http://www.occsupplydemand.org/OSD_Main.aspx?ST=NC

Availability of Program Statewide (Enrollment and Degrees Awarded in Last 3 Years):

- *Public universities* – The below program is a joint program with NCSU and UNC-CH.

| Enrollment | | | Academic Year | | | | | | |
|------------|--------------------------------|----|---------------|--------|---------|--------|---------|--------|---------|
| | | | Fall 06 | Spr 07 | Fall 07 | Spr 08 | Fall 08 | Spr 09 | Fall 09 |
| NCSU | Biomedical/Medical Engineering | MS | 21 | 19 | 23 | 21 | 21 | 18 | 18 |
| UNC-CH | Biomedical/Medical Engineering | MS | 5 | 5 | 6 | 4 | 4 | 3 | 5 |

| Number of Degrees Awarded | | | Academic Year | | |
|---------------------------|--------------------------------|----|---------------|-----------|-----------|
| | | | 2006-2007 | 2007-2008 | 2008-2009 |
| NCSU | Biomedical/Medical Engineering | MS | 6 | 7 | 1 |
| UNC-CH | Biomedical/Medical Engineering | MS | 4 | 4 | 2 |

APPENDIX O

- *Private universities* – Data Sources: Occupational Supply Demand System and the U.S. Department of Education Institute of Education Sciences.

| Number of Degrees Awarded | | | Academic Year | | |
|-----------------------------------------------------------------|--------------------------------|----|---------------|-----------|-----------|
| | | | 2006-2007 | 2007-2008 | 2008-2009 |
| Duke University | Biomedical/Medical Engineering | MS | 20 | 22 | 18 |
| Wake Forest University (Joint with Virginia Tech University) | Biomedical/Medical Engineering | MS | 2 | 3 | 2 |

Available in Online or Distance Format from UNC institutions:

Not available

Available or not from Academic Common Market:

Not available

NCA&T Campus enrollment and degrees awarded in similar programs at the Masters level:

(Based on two CIP digits – 14 CIP is the summary group for Engineering under which Bioengineering is a program.)

| Enrollment | | | Academic Year | | | | | | |
|------------|--------------------------------------------------------|----|---------------|--------|---------|--------|---------|--------|---------|
| | | | Fall 06 | Spr 07 | Fall 07 | Spr 08 | Fall 08 | Spr 09 | Fall 09 |
| NCA&T | Chemical Engineering | MS | 10 | 11 | 10 | 10 | 16 | 19 | 20 |
| | Civil Engineering, General | MS | 32 | 27 | 28 | 24 | 27 | 38 | 40 |
| | Electrical, Electronics and Communications Engineering | MS | 56 | 61 | 47 | 38 | 44 | 46 | 40 |
| | Mechanical Engineering | MS | 25 | 30 | 23 | 19 | 28 | 17 | 18 |
| | Industrial Engineering | MS | 38 | 43 | 42 | 36 | 48 | 39 | 36 |
| | Engineering | MS | 13 | 11 | 11 | 10 | 12 | 11 | 17 |

| Number of Degrees Awarded | | | Academic Year | | |
|---------------------------|--------------------------------------------------------|----|---------------|-----------|-----------|
| | | | 2006-2007 | 2007-2008 | 2008-2009 |
| NCA&T | Chemical Engineering | MS | 5 | 5 | 2 |
| | Civil Engineering, General | MS | 17 | 13 | 11 |
| | Electrical, Electronics and Communications Engineering | MS | 26 | 22 | 22 |
| | Mechanical Engineering | MS | 5 | 11 | 8 |
| | Industrial Engineering | MS | 14 | 8 | 20 |
| | Engineering | MS | 6 | 10 | 2 |

APPENDIX O

Campus Average of enrollment and degrees awarded in this degree area at the Masters level:
(Based on two CIP digits – 14 CIP is the summary group for Engineering under which Bioengineering is a program - over the last 3 Academic Years, Fall 2006-Fall 2009)

| Campus Average | | | |
|-----------------------|------------------------------|----------------------------|-----------------------------|
| | Number of Active Programs | Enrollment per Semester | Degrees Awarded per Year |
| ECU | 1 | 14 | N/A * approved 2006 |
| NCA&T | 6 | 28 | 12 |
| NCSU | 15 | 64 | 26 |
| UNCC | 4 | 48 | 21 |
| UNC-CH | 2 | 4 | 3 |
| Campus Average: | | 32 | 16 |

NCA&T Campus Degree Programs added in the past three years:

- *Bachelor*
 - BS Atmospheric Sciences and Meteorology (11/09/2007)
- *Master*
 - MS Information Technology (09/07/2007)
- *Doctoral*
 - Ph.D. Computational Science and Engineering (01/08/2010)

NCA&T Degree Programs discontinued in past three years:

- *Bachelor*
 - BS Visual Arts, Art Education (03/20/2009)
 - BS Music Education (03/20/2009)
 - BS Romance Languages and Literatures, French Secondary Education (03/20/2009)
 - BS Romance Languages and Literatures, Spanish Secondary Education (03/20/2009)
- *Master*
 - MS English Education (03/20/2009)
 - MS Mathematics Education (03/20/2009)
 - MS History Education (03/20/2009)
- *Doctoral*
 - N/A