BTEC posted a stellar track record in 2018–2019. Enrollment in our academic programs remained strong; more industry professionals participated in the center’s short courses than ever before; and we continued to support industry partners by providing bioprocess and analytical services. In addition, we increased our focus on biomanufacturing research, spearheading new projects funded by the National Institute for Innovation in Manufacturing of Biopharmaceuticals (NIIMBL) and garnering a major grant from the Novo Nordisk Foundation for a new five-year program, AIM-Bio.

Collaborative research and workforce development projects amplify BTEC’s impact

NC State and BTEC, in conjunction with the Technical University of Denmark (DTU) in Copenhagen, will carry out a new five-year project focused on an international collaborative research and training program in biomanufacturing science and technology.

The Accelerated Innovation in Manufacturing Biologics (AIM-Bio) project will establish a world-class program in bioprocess research and development and workforce training that focuses on products and technologies for the future of biopharmaceutical manufacturing. In July 2019, the Novo Nordisk Foundation announced it will provide $27 million in funding for the five-year project, which NC State will manage. NC State will receive $18 million for its activities, and the remainder will go to DTU.

AIM-Bio will provide funding for nine research projects focusing on technologies of critical importance to biopharmaceutical manufacturing, ranging from cell factory engineering to upstream bioreactor design and optimization, to downstream capture and purification operations. In addition, eight new courses will be developed for industry professionals, and the project will also fund an international collaboration and exchange program. Faculty, staff and students from both NC State and the Technical University of Denmark will collaborate on all project activities.

As part of BTEC’s work with the National Institute for Innovation in Manufacturing of Biopharmaceuticals (NIIMBL), the center has led three research and workforce development projects and partnered in four others during the past year. A public-private partnership with the goal of advancing innovation in biopharmaceutical manufacturing, NIIMBL is one of 14 Manufacturing USA institutes, a national network of linked manufacturing institutes that are designed to accelerate U.S. advanced manufacturing. BTEC-led

Undergraduate and graduate enrollment remains strong

For the 2018–2019 academic year, enrollment (i.e., seats filled) in both BTEC undergraduate and graduate courses totaled 821, up 12% from 2017–2018, which saw enrollment of 731. By May 2019, 37 undergraduates had completed the BTEC minor during the year, bringing the cumulative total to 394 minors since it was first awarded in 2009. Twelve graduate students earned master’s degrees from BTEC in 2018–2019. Since the graduate program awarded its first degrees in 2012, 81 individuals have now earned either the Master of Science in biomanufacturing or the Master of Biomanufacturing.

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ANNUAL & CUMULATIVE NUMBERS OF PROGRAM GRADUATES

- Undergraduate minor: 37 in FY19
- Graduate degrees: 12 in FY19
- Undergraduate certificate: 3 in FY19, 63 total
- Graduate certificate: 6 in FY19, 16 total
**Collaborative research and workforce development projects amplify BTEC’s impact**

Continued from front

projects are catalyzing the development of new hands-on curriculum in automation, single-use production of monoclonal antibodies, and AAV vector production for gene therapy. This curriculum will help ensure that BTEC students and professional development participants are prepared to tackle the challenges that scientific and technological advances are bringing to biopharmaceutical manufacturing.

**ACADEMIC PROGRAMS (cont.)**

**Robust employment rates continue**

Of the 12 master’s students who graduated in 2018–2019, six were employed full time while enrolled in the program. Five (42%) of the remaining graduates secured full-time positions in industry prior to graduation, for a total of 92% employed. BTEC's graduate program continues to boast a 99% placement rate within six months of graduation. BTEC undergraduate programs have a placement rate of over 95% (employment or acceptance into a graduate program) within six months of graduation.

**Scholarships and student activities round out the academic programs**

In 2018–2019, 14 undergraduates received BTEC scholarships, which are sponsored by industry firms bioMerieux, EMD Millipore, Fujifilm Diosynth, KBI Biopharma, Saint Gobain, Sartorius-Stedim and Steris. BTEC staff serve as faculty advisors for the NC State student chapter of the International Society for Pharmaceutical Engineering (ISPE), which provides undergraduate and graduate students with career development opportunities. In addition, BTEC hosted 25 seminars by industry professionals and firms during the year to help develop career-ready graduates.

**New accelerated bachelor’s-to-master’s (ABM) program approved**

In 2018–2019, NC State approved an ABM program that enables chemical engineering undergraduates to earn a bachelor’s degree in chemical engineering and a master’s degree in biomanufacturing in five years. In their senior year, students in this program complete graduate courses that count toward both degree requirements. After the fifth year of study, they earn the master’s degree.

**CONTRACT SERVICES**

**Contract services support industry, academia**

BTEC’s Bioprocess Services and Analytical Services units served industry and academic partners from within and outside North Carolina by carrying out 18 projects during 2018–2019. They included amino acid analysis on spent media; cleaning studies utilizing ozone; HPLC analysis for abamectin; HPLC analysis for aflatoxin; HPLC analysis for doxorubicin; HPLC analysis for fluopyram; mycoplasma testing for cell banks; scale up and production of bacterial cell mass; scale up and production of novel proteins for enzyme replacement therapies; screening of novel chromatography media; stability studies using chemical titration; testing of prototype disposable storage bags; and testing of sampling ports in closures for disposable cell culture vessels.

**PROFESSIONAL DEVELOPMENT**

**Professional development program sees record enrollment for 2nd consecutive year**

BTEC continues to see increasing demand for its training program offered to industry professionals. From July 1, 2018, through June 30, 2019, BTEC provided 18 open enrollment professional development course offerings and 19 course offerings customized for individual companies. Total enrollment in these courses reached an all-time high with 464 professionals from around the world, surpassing the previous record enrollment of 456 professionals in FY 2018. Aided by funding from NIIMBL and the North Carolina Biotechnology Center, BTEC added a new short course, Hands-on cGMP Biomanufacturing of Vectors for Gene Therapy, to its training program.

**Maintenance/Instrumentation 2%**

**QC/QA/RA/Validation 8%**

**Scientist/Lab Research 19%**

**Operations/Planning 3%**

**Engineering 15%**

**Sales/Marketing 21%**

**Teacher/Academia 3%**

**Manufacturing 29%**

**TOTAL PARTICIPANTS FY10–FY19**

3,325

Visit us at www.btec.ncsu.edu.

See more photos and highlights from the past year at:

go.ncsu.edu/btecannualreport

Golden LEAF Biomanufacturing Training and Education Center

850 Oval Drive

Raleigh, NC 27606

(919) 513-2000

The Golden LEAF foundation provided almost $39 million to construct the BTEC facility.

NC State University promotes equal opportunity and prohibits discrimination and harassment based upon one’s age, color, disability, gender identity, genetic information, national origin, race, religion, sex (including pregnancy), sexual orientation and veteran status. 500 copies of this public document were printed at a cost of 48¢ per copy.