

**BOARD OF HIGHER EDUCATION
REQUEST FOR COMMITTEE AND BOARD ACTION**

COMMITTEE: Academic Affairs

NO: AAC 18-09

COMMITTEE DATE: December 5, 2017

BOARD DATE: December 12, 2017

**APPLICATION OF SPRINGFIELD TECHNICAL COMMUNITY COLLEGE TO AWARD
THE ASSOCIATE IN SCIENCE IN BIOMEDICAL ENGINEERING TECHNOLOGY**

MOVED: The Board of Higher Education hereby approves the application of
Springfield Technical Community College to award the **Associate
in Science in Biomedical Engineering Technology**

Upon graduating the first class for this program, the College shall submit to the Board a status report addressing its success in reaching program goals as stated in the application and in the areas of enrollment, curriculum, faculty resources, and program effectiveness.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b)

Contact: Winifred M. Hagan, Ed.D.,
Associate Commissioner for Academic Affairs and Student Success

BOARD OF HIGHER EDUCATION

December 2017

Springfield Technical Community College Associate in Science in Biomedical Engineering Technology

INTENT AND MISSION

The proposed Biomedical Engineering Technology Associate in Science program is designed to align with the mission of Springfield Technical Community College (STCC) by creating a new career opportunity for students. It is intended that graduates of the proposed program will be academically prepared to enter the workforce as Biomedical Equipment Technicians or to transfer to baccalaureate institutions where they may pursue an undergraduate major in engineering technology or related fields.

It is intended that the Biomedical Engineering Technology Program places emphasis on the knowledge and skill level needed to successfully address the needs of many types of medical equipment technologies including the highly specialized and sophisticated equipment and instrumentation found in health care settings.

STCC intends that students will become technically proficient in three major areas: repairing, maintaining (Biomedical Equipment Option) and manufacturing biomedical instruments (Biomedical Manufacturing Option). Throughout the program, students will repair, test, maintain and manage a large variety of medical equipment technologies. STCC plans that performance testing procedures and equipment management practices will be emphasized and performed in the lab and hospital setting. Classroom content is expected to focus on the use, design, manufacture and operation of medical equipment. It is intended that this program may also serve as the first two years of study in an undergraduate degree in Engineering Technology.

Graduates of the proposed program are expected to be prepared to serve as biomedical engineering technicians in hospitals and medical research centers, either as employees of these institutions or contracted service firms, who are capable of installing, inspecting, maintaining, repairing and calibrating biomedical equipment.

The proposed program has obtained all necessary governance approvals on campus and was approved by the Springfield Technical Community College Board of Trustees on September 18, 2017. The required letter of intent was circulated on April 18, 2015. No comments were received.

NEED AND DEMAND

National and State Labor Market Outlook

STCC reports that according to the Economic Council of Western Massachusetts, Western Massachusetts is home to more than 300 medical device companies with support from world-class universities, research-driven hospitals and an abundance of high-precision manufacturing facilities. Its 50,000 workers, nine hospitals, and 100 clinics or related facilities make healthcare

the largest private industry in Western Massachusetts and a leading economic driver for the region.

Specifically, Baystate Health, the parent organization of Baystate Medical Center, is the region's largest medical facility with four-campus and an 800-bed teaching and research hospital. It further serves as the western MA campus of Tufts University School of Medicine. The Pioneer Valley Life Sciences Institute serves as Baystate Health's biotechnology research facility, founded and operated through a partnership with the University of Massachusetts Amherst. Mercy Medical Center, the region's second largest hospital, is located in Springfield MA. Comprehensive services are provided through its staff of nearly 3,000, on a large campus, which encompasses emergency treatment, short and long-term care, and physician offices. The Shriners' Hospital for Children is a 40-bed pediatric orthopedic hospital. Other hospitals in the region include Cooley Dickinson, Holyoke Medical Center, and Baystate Noble and Baystate Wing Memorial hospitals. STCC reports that these facilities utilize state-of-the-art technology to deliver an advanced level of medical care and that local colleges and universities support the industry by offering a spectrum of career training and degree programs to an ever-growing regional health care workforce.¹

Student Demand

STCC enrollment data suggests that student demand for STEM programs in general remains strong and 20% of STCC students express an interest in working in health care. Many of these students have not matriculated into a health program and are exploring options available at STCC. The Health Information Management, Medical Laboratory Technician and the proposed program respond to a perceived demand from STCC students and to existing demands in the healthcare industry. STCC further expect that returning adult-students represent a demand for the proposed program.

OVERVIEW OF PROPOSED PROGRAM

In early 2010 a committee was formed by STCC faculty in the School of Engineering Technologies and Mathematics to investigate the possibility of creating a Biomedical Engineering Technology Associate Degree Program. In September 2012 a planning grant was developed and in November 2014 the proposal was submitted to The Massachusetts Life Sciences Center. In December 2015 the grant was awarded and proposal development began. Representatives from STCC, Baystate Medical Center and the Biomedical Engineering Alliance & Consortium were included in planning the proposed program. The proposed program will reside in the School of Engineering Technologies and Mathematics. It is expected to offer opportunities for students to enter the workforce or to transfer to a four year program. The proposed program is not designed to be a transfer program, rather its primary focus is to prepare students to enter the workforce upon completion. However STCC does expect ~10% of graduates to pursue further education.

STCC reports that it recently signed an articulation agreement with Northeastern University's Lowell Institute School (LIS). The agreement supports transfer from existing programs into a BS program in Mechanical Engineering Technology or Advanced Manufacturing Systems.

¹ *The Economic Council of Western Massachusetts Website (<http://westernmassedc.com>)*

STCC plans that LIS will offer its courses on the STCC campus and plans that this opportunity will be extended to include graduates of the proposed BET Manufacturing Option.

STCC also plans to develop dual-enrollment opportunities in PK-12 districts through its *College Now* program, which provides grades 11 and 12 students with the opportunity to take one course each term at no charge, up to 8 courses. It is planned that dual enrollment opportunities will include summer, fall and spring semesters. Through statewide MCCEO/DESE articulations, high school student who complete high school equivalents for “Electronics for Technicians” (Pathfinder Regional Vocational Technical High School) or “Operating Systems 1” or “Introduction to Computer Systems” (Chicopee Comprehensive High School, Lower Pioneer Valley Educational Collaborative or Roger L. Putnam Technical Academy) would receive STCC credit for these courses upon matriculation. STCC also plans to establish course articulations for CISCO courses with Springfield Central High School.

Duplication

STCC reports that no other community college in Massachusetts offers an AS biomedical engineering Technology program with 2 different tracks. Bristol Community College in the eastern part of the state offers a biomedical manufacturing program but does not offer a program that is focused on equipment. Quinsigamond Community College offers a biomedical program as an option within an electronics program. The Benjamin Franklin Institute of Technology in Boston offers an AS degree in biomedical engineering technology.

ACADEMIC AND RELATED MATTERS

Admission

It is planned that STCC will require a high school diploma or its equivalent and all transcripts from any previous post-secondary study when submitting an application for admission. STCC plans that a minimum grade of C- will be required for transfer of credit and that only courses with content similar to those offered at STCC will be accepted for credit.

PROGRAM ENROLLMENT

	Year 1	Year 2	Year 3	Year 4
New Full-Time	20	20	25	25
Continuing Full-Time	0	16	16	20
New Part-Time	8	8	10	10
Continuing Part-Time	0	6	6	8
Totals	28	50	57	63

Curriculum (Attachment A)

The proposed program anticipates that it will offer students the opportunity to take certification exams including, Certified Solid Works Associate Exam (CSWA) which is offered annually at the end of the spring semester. While STCC does not plan that the BET program will require students to sit for industry certifications in order to graduate, students will be strongly encouraged to sit for the AAMI Certified Biomedical Equipment Technician, Cisco ICND1 Interconnecting Network Devices, CompTIA A+ CompTIA Network +, and Certified SolidWorks Associate Exam (CSWA) after they have earned the AS degree. The major certification for this field is Certified Biomedical Equipment Technician (CBET)®. Requirements for this certification include two years of full-time Biomedical Engineering Technology experience in addition to the AS degree. Recognizing that CBET certification enhances career and salary opportunities, STCC expects to help prepare students for the exam and will encourage graduates to take the exam when they become eligible to do so.

Internships or Field Studies

There are no internships or field studies planned for this program outside of experiential learning within course content.

RESOURCES AND BUDGET

Fiscal (Attachment B)

Faculty and Administration (Attachment C)

STCC expects the proposed program to require the addition of one faculty member to serve as a department chairperson. Once the program is approved STCC will search for qualified candidates with a graduate degree in biomedical engineering, bioengineering, clinical engineering, electrical engineering, and mechanical engineering with research in biomedical applications. As well, STCC plans to identify candidates with experience in clinical engineering, imaging, and medical devices.. In addition STCC plans to leverage existing faculty and facilities from the Computer Systems Engineering, Electronics Engineering and Mechanical Engineering departments.

Facilities, Library and Information Technologies

It is anticipated that STCC's SIMS Medical Center™ will provide state-of-the-art medical equipment for training students in the proposed program. Curriculum, lab facilities and equipment are reported to be already in place at STCC and will be utilized for the Biomedical Engineering Technology Associate Degree program.

Affiliations and Partnerships

Advisory board membership is expected to be comprised of representatives from industry (biomedical equipment manufacturers, hospitals, and medical equipment field service engineers) as well as STCC administration and faculty. It is planned that the advisory board's role will be to inform the program's understanding of the medical equipment business, market, industry trends, innovations, and provide a networking platform for students and

manufacturers. It is also expected to monitor program performance and help STCC administration and faculty continually improve the program. Partnerships have been established with industry leaders including Ford Motor Company, IBM, Hamilton Standard, Pratt & Whitney, Verizon, Cisco and Microsoft, among others. In addition, the University of Massachusetts Amherst and Western New England University were prior partners with STCC in the *Massachusetts Life Science Grant*, which funded equipment for the proposed program. STCC expects to work with both institutions in developing articulation agreements for student transfer. Once approval is earned, STCC expects that articulation agreements will also be sought with the University of Massachusetts Lowell and Worcester Polytechnic Institute.

STCC provides information sessions at local high schools to promote student interest in a range of programs and the proposed program will be included in this. STCC also offers a number of opportunities for students from middle and high schools in Springfield and the surrounding communities to visit and explore the campus. Dual enrollment opportunities are offered to high school juniors and seniors. STCC has expanded outreach and has a heightened presence at community events including information sessions at local high schools and businesses, 'instant-accept' days at area high schools, information booths at community events, and partnerships with organizations such as CareerPoint and Future Works and the Regional Employment Board of Hampden County. Through the proposed Biomedical Engineering Technology AS degree offering, STCC expects to reach underserved groups of prospective students from diverse communities.

PROGRAM EFFECTIVENESS

Goal	Measurable Objective	Strategy for Achievement	Timetable
Provide BET students with ongoing opportunities to become gainfully employed.	Job Placement	Career Services at STCC offers employment assistance to both graduating students and alumni at each step in the career search process. The Office of Institutional Research (OIR) tracks job placement the 2016 aggregate graduate response rate was 75% for job placement	Beginning Spring 2020
Provide BET students with ongoing opportunities to learn about transfer options and programs.	Program and transfer information will be provided to BET students through transfer counseling, face-to-face discussions with Admissions counselors and faculty from those institutions.	Annual luncheons and career fairs will be coordinated between BET students and transfer institutions for the purpose of facilitating student contact with Admissions counselors.	Ongoing, beginning in Spring of 2019

Establish Articulation (or MassTransfer) Agreements with Bachelor Degree granting institutions	Executed articulation agreements with 4-year institutions that afford BET graduates transfer opportunities.	BET Chair will meet with Program Chairs at the transfer institutions to draft articulation agreements	Begin process in Fall of 2018 agreements in place by the 2019/20 Academic Year.
Build a strong connection with Western Massachusetts industry leaders and hospitals.	Student site visits to hospitals and manufacturing firms, discussions with industry leaders in the classroom, inclusion of industry leaders in Advisory Board meetings and program reviews.	BET Chair will meet with industry leaders in fields of Clinical Engineering, Biomedical Engineering and Biomedical Engineering Manufacturing to build support for the BET program, solicit guest speakers for BET seminars, develop student work experience opportunities, and solicit new Advisory Board Members	Ongoing; beginning in Fall 2018
Work with industry leaders to remain on the "cutting edge" of new technologies and market shifts.	Faculty affiliation with the Association for the Advancement of Medical Instrumentation and the New England society of Clinical Engineering and attendance at professional conferences.	Faculty will be encouraged (and provided support) to attend conferences and workshops involving new technologies	Ongoing, beginning in 2018-19 Academic Year
Educate and train BET students in new technologies and emerging markets.	Annual reviews of (and adjustments to) the BET curriculum with the guidance of the Program Advisory Board, to retain currency and relevancy. Development of program options within the BET curriculum.	Faculty will work with Advisory Board, Dean of Engineering Technologies, and the Curriculum Committee to implement curricular updates as necessary.	Ongoing, beginning in 2018-19 Academic Year
Hire a BET faculty member/chairperson.	One additional full-time faculty member by Fall 2018	Position will be posted and a search committee established in Spring 2018	Fall 2018

Institutional data regarding enrollment trends, retention and graduation rates, student/faculty ratios, and credit hours are provided to the departments as a baseline for program review. Additionally, academic program advisory boards, employer and graduate surveys, industry benchmarking, and surveys of student engagement provide external perspectives.

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed by Brian Bell, Ph.D., professor of Biomedical Engineering Technology at St Petersburg College in Florida, and by Michele Dischino, Ph.D., assistant professor of engineering and technology education at Central Connecticut State University. The reviewers indicated that the proposed program design initially exposes students to content, followed by application in a lab setting. They found the courses to be sequenced appropriately starting with fundamentals and moving to higher complexity. The team also noted that there is a need for trained technicians among hospitals, manufacturers, and third party service providers in the region. The reviewers made a few recommendations regarding assessments and faculty recruitment, and further indicated that students graduating from the proposed program would be competitive and that the program and course design set the bar higher than the average biomedical engineering technology associate degree program in the U.S.

STTC responded to the assessment recommendations by adjusting the design of the program and noted that faculty with appropriate certifications are currently appointed at STCC and will be engaged in teaching within the proposed program

STAFF ANALYSIS AND RECOMMENDATION

Staff thoroughly reviewed all documentation submitted by Springfield Technical Community College and the external reviewers. Staff recommendation is for approval of the proposed **Associate in Science in Biomedical Engineering Technology**.

ATTACHMENT A: CURRICULUM

Biomedical Equipment Technology Option

Required (Core) Courses in the Major (Total # courses required = 13)		
Course Number	Course Title	Credit Hours
CSE-110/110L	Introduction to Computer Systems	3
BMT-101	Intro to Biomed Devices and Industry	3
ELE-110/110L	Electronics for Technicians 1	3
ELE-180/180L	Instrumentation and Measurement	4
ELE-115/115L	Electronics for Technicians 2	3
ELE-111/111L	Internet of Everything (IOE)	4
BMT-210/210L	Biomed Systems 1	4
BMT-220/220L	Sensors for Biomed Systems	4
CSO-105/105L	Cisco Intro to Networks	4
BMT-230	Biomedical Wireless Networks	3
CSO-155/155L	Cisco Routing and Switching Essentials	4
BMT-250/250L	Biomedical Systems 2	4
BMT-260	Biomedical Internship	3
	Sub Total Required Credits	46
Distribution of General Education Requirements Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		# of Gen Ed Credits
Arts and Humanities, including Literature and Foreign Languages		
ENG-101	English Comp 1	3
ENG-102 or 104	English Comp 2 or Tech Writing	3
Mathematics and the Natural and Physical Sciences		
MAT-124	Tech Math 1	4
MAT-115	Statistics	3
BIO-120/120L	Basics of Anatomy and Physiology	4
PHY-180/180L	Physics of Light and Lasers	4
Social Sciences		

XXX-XXX	Social Science Elective	3
Sub Total General Education Credits		24
Curriculum Summary		
Total number of courses required for the degree		20
Total credit hours required for degree		70

Biomedical Manufacturing Technology Option

Required (Core) Courses in the Major (Total # courses required = 13)		
Course Number	Course Title	Credits
CSE-110/110L	Introduction to Computer Systems	3
BMT-101	Intro to Biomed Devices and Industry	3
BMT-228/228L	Quality Concepts for the Medical Industry	3
BMT-270/270L	Capstone	4
ELE-110/110L	Electronics for Technicians 1	3
ELE-180/180L	Instrumentation and Measurement	4
MET-120/120L	Metrology and Geometrics	3
MET-160/160L	Engineering Graphics with Solid Works	3
MET-161/161L	Solid Modeling for Mechanical Design 1	4
MET-140	Materials and Manufacturing Concepts	3
MET-227/227L	Quality Concepts	3
LEO-150/150L	Intro to Lasers	3
LEO-260	Industrial Laser Applications	3
	Sub Total Required Credits	42
Distribution of General Education Requirements Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		# of Gen Ed Credits
Arts and Humanities, including Literature and Foreign Languages		
ENG-101	English Comp 1	3
ENG-102 or 104	English comp 2 or Tech Writing	3
Mathematics and the Natural and Physical Sciences		
MAT-124	Tech Math 1	4
MAT-115	Statistics	3
BIO-120/120L	Basics of Anatomy and Physiology	4
PHY-180/180L	Physics of Light and Lasers	4
Social Sciences		
XXX-XXX	Social Science Elective	3
Sub Total General Education Credits		24
Curriculum Summary		
Total number of courses required for the degree		20
Total credit hours required for degree		66

ATTACHMENT B: BUDGET

A grant from the Massachusetts Life Sciences Center was used to purchase equipment and to perform class/lab renovations.

One Time/ Start Up Costs	Cost Categories	Annual Expenses			
		Year 1	Year 2	Year 3	Year 4
	Full Time Faculty (Salary & Fringe)	\$89,152	\$90,935	\$92,753	\$94,608
	Part Time/Adjunct Faculty (Salary & Fringe)				
	Staff				
	General Administrative Costs				
	Instructional Materials, Library Acquisitions				
Mass Life Science Grant \$364,000	Facilities/Space/Equipment	\$5,000	\$5,000	\$5,000	\$5,000
	Field & Clinical Resources				
	Marketing				
	Other (Specify)				
	TOTALS	\$94,152	\$95,935	\$97,753	\$99,608

One Time/Start-Up Support	Revenue Sources	Annual Income			
		Year 1	Year 2	Year 3	Year 4
	Grants				
	Tuition	\$19,200	\$34,400	\$39,200	\$43,200
	Fees	\$117,792	\$232,190	\$266,438	\$290,560
	Departmental				
	Reallocated Funds				
	Other (specify)				
	TOTALS	\$136,992	\$232,190	\$266,438	\$290,560

ATTACHMENT C: FACULTY

Summary of Faculty Who Will Teach in Proposed Program							
Name of faculty member (Name, Degree and Field, Title)	Check if Tenured	Courses Taught Put (C) to indicate core course. Put (OL) next to any course currently taught online.	Number of sections	Division of College of Employment	Full- or Part-time in Program	Full- or part-time in other department or program (Please specify)	Sites where individual will teach program courses
Bigos, Edward B.S. Electrical Engineering Professor and Department Co-Chair Electronics Technology Cluster	X	<ul style="list-style-type: none"> • Introduction to Computer Systems (C) • Lab: Introduction to Computer Systems (C) • Cisco Intro to Networks (C) • Lab: Cisco Intro to Networks (C) • Cisco Routing and Switching Essentials (C) • Lab: Cisco Routing and Switching Essentials (C) • Internet of Everything (C) • Lab: Internet of Everything (C) 	3 2 2 2 2 3 1	School of Engineering Technologies and Mathematics	Full Time	Full Time Computer Systems Engineering Technologies and Mathematics	Main Campus
Cooper, Jeffrey B.S. Electrical and Computer Engineering Assistant Professor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Electronics for Technicians 1 (C) • Lab: Electronics for Technicians 1 (C) • Electronics for Technicians 2 (C) • Lab: Electronics for Technicians 2 (C) 	2 2 2 2	School of Engineering Technologies and Mathematics	Full Time	Part Time Computer Systems Engineering Technology Part Time Electronic Systems Engineering Technology	• Main Campus
Disa, Ralph B.S. Mechanical Engineering M.S. Mechanical Engineering Assistant Professor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Materials and Manufacturing Concepts (C) • Quality Concepts (C) • Lab: Quality Concepts (C) • Quality Concepts for 	3 2 2 1	School of Engineering Technologies and Mathematics	Full Time	Full Time Mechanical Engineering Technology	• Main Campus

		the Medical Industry (C) • Lab: Quality Concepts for the Medical Industry (C)	1				
Masciadrelli, Gary B.S. Mechanical Engineering M.S. Mechanical Engineering Professor and Department Chair, Mechanical Engineering Technology	X	Solid Modeling for Mechanical Design 1 (C) • Lab: Solid Modeling for Mechanical Design 1 (C) • Engineering Graphics with Solid Works (C) • Lab: Engineering Graphics with Solid Works (C)	1 1 1 1	School of Engineering Technologies and Mathematics	Full Time	Full Time Mechanical Engineering Technology	Main Campus
Minor, Thomas A.S. Mechanical Engineering Technology Instructor	<input type="checkbox"/>	• Lab: Metrology and Geometrics (C)	1	School of Engineering Technologies and Mathematics	Full Time	Full Time Mechanical Engineering Technology	• Main Campus
Mullett, Gary B.S. Electrical Engineering M.S. Electrical Engineering Professor and Department Co-Chair Electronics Technology Cluster	X	• Instrumentation and Measurement (C) • Lab: Instrumentation and Measurement (C) • Sensors for Biomed Systems (C) • Lab: Sensors for Biomed Systems (C) • Biomedical Wireless Networks (C)	1 1 1 1 1	School of Engineering Technologies and Mathematics	Full Time	Part Time Computer Systems Engineering Technology Part Time Electronic Systems Engineering Technology	• Main Campus
Sipitkowski, Joseph B.S. Mechanical Engineering Professional Engineer Assistant Professor	<input type="checkbox"/>	• Metrology and Geometrics (C) • Lab: Metrology and Geometrics (C) • Engineering Graphics with Solid Works (C) • Lab: Engineering Graphics with Solid Works (C)	2 2 1 1 1	School of Engineering Technologies and Mathematics	Full Time	Full Time Mechanical Engineering Technology	• Main Campus

		<ul style="list-style-type: none"> • Solid Modeling for Mechanical Design 1 (C) • Lab: Solid Modeling for Mechanical Design 1 (C) 	1				
Vangel, Peter B.S. Physics M.S. Electrical Engineering Professor	X	<ul style="list-style-type: none"> • Intro to Lasers (C) • Lab: Intro to Lasers (C) • Industrial Laser Applications (C) 	1 1 1	School of Engineering Technologies and Mathematics	Full Time	Full Time Laser Electro-Optics Technology	• Main Campus
TBA Graduate degree in Biomedical Engineering, Bioengineering, Clinical Engineering, Electrical Engineering, Mechanical Engineering or related field	<input type="checkbox"/>	<ul style="list-style-type: none"> • Intro to Biomed Devices and Industry (C) • Biomedical Systems 1 (C) • Lab: Biomedical Systems 1 (C) • Biomedical Systems 2 (C) • Lab: Biomedical Systems 2 (C) • Biomedical Internship (C) 	1 1 1 1 1 1	School of Engineering Technologies and Mathematics	Full Time	Full Time Biomedical Engineering Technology	• Main Campus