

BOARD OF HIGHER EDUCATION
REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs

NO.: AAC 14-30

COMMITTEE DATE: March 11, 2014

BOARD DATE: March 18, 2014

**APPLICATION OF BENJAMIN FRANKLIN INSTITUTE OF TECHNOLOGY TO
AWARD THE BACHELOR OF SCIENCE IN MECHANICAL ENGINEERING
TECHNOLOGY**

MOVED: The Board of Higher Education hereby approves the Articles of Amendment of **Benjamin Franklin Institute of Technology** to award the **Bachelor of Science in Mechanical Engineering Technology**.

Authority: Massachusetts General Laws, Chapter 69, Section 30 *et seq.*

Contact: Shelley Tinkham, Ph.D., Assistant Commissioner for Academic, P-16 and Veterans Policy

BOARD OF HIGHER EDUCATION

March 2014

Benjamin Franklin Institute of Technology Bachelor of Science in Mechanical Engineering Technology

INTENT

Benjamin Franklin Institute of Technology (BFIT) a New England Association of Schools and Colleges (NEASC) -accredited, private coeducational institution, located in Boston, MA, requests authorization to offer the Bachelor of Science in Mechanical Engineering Technology (BSMET). The proposed program builds on the institution's associate degree in Mechanical Engineering Technology. While a two-year program provides the technical fundamentals within the field of mechanical engineering technology, a bachelor's program would allow development of more detailed and specialized knowledge in the discipline as well as more mature skills in communication, information literacy, and problem solving. Upper division students also have greater opportunity to explore the linkage between management, quality systems, and technical production. The proposed program is designed to be completed full-time.

Baccalaureate graduates in this field are often referred to as mechanical engineering technologists. These professionals make sketches and rough layouts, CAD drawings, record and analyze data, make calculations and estimates, and report their findings to mechanical engineers. They also help with manufacturing processes on the shop floor, or with development phases in research and development labs before manufacturing takes place. Graduates of the proposed program will be prepared for the metal and manufacturing process industries, research and development organizations, medical device and pharmaceutical companies and new industries focused on the production of alternative energy and re-manufacturing.

The Bachelor of Science in Mechanical Engineering Technology was approved by BFIT's Board of Trustees on January 21, 2013.

INSTITUTIONAL OVERVIEW

For over one hundred years, Benjamin Franklin Institute of Technology has been educating technologists. The Institute is Benjamin Franklin's living legacy in Boston. It evolved directly from his bequest of £1000 to "the Inhabitants of the Towne of Boston," set forth in a codicil to his will dated 1789. In his codicil, he wrote, "I have considered that among Artisans good Apprentices are most likely to make good Citizens." He specified that for the first hundred years his bequest be used as a revolving loan fund to help young married tradesmen start their own businesses, the fund managers to be the Selectmen of the Town of Boston and the ministers of the oldest Episcopalian, Congregational, and Presbyterian churches in the town. This money eventually came to the Institute through a fund established to hold the trust's money.

With the demise of the apprentice system in the 19th century, the Franklin Fund managers decided that Dr. Franklin's intentions could best be served by some form of public education serving the people of Boston. In December 1904, Andrew Carnegie who was an admirer of Franklin agreed to match the money in the Franklin Fund to build the College on two conditions: that the new school be an industrial school similar to the Cooper Union and New York City's Mechanics' and Tradesmen's School, and that the City of Boston provide the land. The

agreement was struck. The institution began as the Franklin Union. It would change its name again to the Franklin Institute of Boston in 1961. In 2001, the College became the Benjamin Franklin Institute of Technology.

In 1957, the institution received approval to grant the Associate in Engineering degree; and by 1971 students could choose from six associate degree programs. In 1983, approval was given to award the Associate in Science in Automotive Technology degree and in 1995, BFIT was authorized to award the Bachelor of Science in Automotive Technology. In 2006, the institution was approved to offer the Honorary Bachelor of Humane Letters and Associate in Science in Opticianry. In 2011, the institution was approved to change the Associate in Engineering degrees to Associate in Science degrees in Architectural Technology, Computer Engineering Technology, Computer Technology, Electrical Technology, Electronic Engineering Technology, Mechanical Engineering Technology, and Medical Electronics Engineering Technology. The BS in Automotive Technology was changed to a BS in Automotive Management in 2011. Approval to grant a Bachelor of Science Health Information Technology was granted in 2012. The institution requested in 2013 that the Associate in Science in Architectural Technology be changed to an Associate of Science in Building Technology and Design and that the Associate of Science in Medical Electronics Engineering be changed to an Associate of Science in Biomedical Engineering Technology. Authority to offer the Associate in Science in Health Information Technology, Associate in Science in Construction Management and Associate in Science in Technology Business and Management was granted in 2013.

The Institute currently seeks the authority to offer the Bachelor of Science in Mechanical Engineering Technology.

ACADEMIC AND RELATED MATTERS

Admission Requirements

Students entering Benjamin Franklin Institute of Technology must have a high school diploma or GED. Incoming students are assessed using a variety of tools to develop a profile of the individual's cognitive and non-cognitive strengths and challenges. This profile is used for placement in initial courses. Students are admitted to the bachelor's program provided they are prepared for college-level English and math. Students who require additional development before beginning college studies are admitted case-by-case or are referred for additional support. The college welcomes transfer students. Transfer credit may be granted for courses completed with a C or better and is based on recommendations from the department chairs of each curricular area. Students at BFIT in other majors would be able to transfer internally.

Tuition and Fees

Based on AY2012-2013 gross tuition, total cost for the four year proposed program is \$70,100.

Projected Enrollment

PROGRAM ENROLLMENT PROJECTION

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	22	18	21	24
Continuing Full Time	0	19	22	24
New Part Time	0	4	2	2
Continuing Part Time	0	0	4	6
Totals	22 (22 FTE)	41 (39 FTE)	49 (46 FTE)	54 (52 FTE)

These enrollment projections include juniors and seniors who continue from BFIT's MET Associate's degree or who transfer in from other suitable two-year programs. Freshmen and sophomores are only included to the extent that they have enrolled in the METAS program with the express intention of continuing for the BS. These latter are considered new enrollees attracted to the college by the BS program.

In Year 2, 85 percent of Year 1 students are projected to be retained.

In Year 3, the program will have its first graduates; 8 are estimated to complete. Retention is projected at 85 percent, in line with the college's experience with bachelor's students.

In Year 4, 13 are expected to graduate, and 85 percent are expected to be retained.

Curriculum (Attachment A)

The program requires the completion of 137 credits. 71 credits are required in the technical core courses, 12 credits are taken in the elective technical area, and 54 credits of general education are required. A student must earn the Associate of Science in Mechanical Engineering or a related field before being allowed to take upper division courses in the Mechanical Engineering Technology program.

PROGRAM EFFECTIVENESS

Upon successful completion of the Bachelor's Degree in MET, the graduate will be able to:

- Utilize computer aided design principles to produce engineering drawings and to analyze interference fits and tolerances.
- Program and operate computer-controlled equipment in an industrial environment.
- Understand manufacturing processes and their uses in industry.
- Design and build products and equipment for a changing technical environment.
- Demonstrate knowledge of mathematics and the ability to apply this knowledge as practiced in materials, metrology and quality systems, statics, dynamics, physics, thermodynamics, heat transfer, electromechanical systems, instrumentation and controls, mechanisms and machine design.

- Effectively communicate technical observations, results, issues and successes in both oral and written form.
- Demonstrate the fundamental skills necessary for continuing their education towards a higher degree in mechanical engineering technology, or related fields.
- Understand professional, ethical and social responsibilities.
- Work effectively in a team-oriented and project-focused work environment as demonstrated in the Senior Design and Manufacture Project.

Each academic department at the college undergoes a comprehensive academic program review process. At the core of this review is an inquiry into the stated goals and student learning outcomes of the program. The process includes a study of student resources as well as student enrollment, retention, and graduation data. Curriculum is reviewed and analyzed and program facilities are examined to identify both physical and technological needs. The result of the academic program review process is a self-study document that provides a critical analysis of the effectiveness of the program and creates a blueprint for improvement to the program. A comprehensive five-year plan ensures that each program regularly undergoes this systematic review.

RESOURCES AND BUDGET (Attachment B)

Administration and Faculty

BFIT recruited a new chair of the Mechanical Engineering Technology department in Spring 2012, with the understanding that a BS MET would be developed in the future. The new chair and two existing full-time faculty will provide instruction in the new program. The BS MET builds on the existing Associate in Science in Mechanical Engineering Technology and will be administered as part of the Mechanical Engineering Technology Department.

The institution has thirty-four full-time faculty and thirty-eight part-time faculty.

Library and Information Technology

The proposed program will utilize current resources held by the library in support of the associated degree. Resources include books, e-books, online databases and periodicals. The library receives support in the operating budget each year to expand as necessary the resources held. This program will benefit from the college's existing investment in a mechanical laboratory, including conventional and CNC machining equipment, SolidWorks software, and an industrial robotics trainer. The campus facility includes 27 laboratories, 12 classrooms, student spaces, and offices on a three-acre campus in the South End neighborhood of Boston. The campus centers on the Franklin Union Building, an historic 1908 structure designed specifically for technical education.

Financial Resources

The budgets for the proposed programs are provided in Attachment B. The costs for the proposed programs are incremental as they build on a currently offered degree and existing capacity.

EXTERNAL REVIEW

The proposed program was reviewed by committee members David Dvorak, Chair, Mechanical Engineering Technology, University of Maine; Isa Bar-on, Professor of Mechanical Engineering Technology, Worcester Polytechnic Institute; and Alan Hadad, Professor of Physics, Hartford University.

The evaluation included the team's review of the written proposal submitted to the MA DHE to offer the Bachelor of Mechanical Engineering Technology degree. The evaluators reviewed the petition and appendices and the institution's proposal beginning in late August 2013. The review team also held conference calls with Interim President Anthony Benoit and Academic Dean Brian Bicknell. There was no site visit to the institution. The criteria that guided the review were the standards currently utilized by the New England Association of Schools and Colleges, supplemented by the criteria of the Independent Institutions of Higher Education Standards, 610 C.M.R. 2.08 (3) (b) through (g).

The evaluators made several recommendations to the institution:

- They encouraged the Institute to adapt the institution's strengths in student support to serve the needs of baccalaureate-level students, and support the professional development of the faculty who will be teaching the upper-division courses in this program,
- Continue to refine the BSMET department outcomes in conversation with program stakeholders, such as the program's Industrial Advisory Committee,
- Implement a process whereby a rollout of the program is paced in a way that promises adequate readiness of the new courses,
- Consider chemistry as a prerequisite course for Material Science,
- Address the issue of faculty professional development as it implements its plans to extend its program to the BS in Mechanical Engineering Technology,
- The administration should fund the library at the requested amount for the 2014-2015 budgetary cycle, which will significantly improve the resources available to support the BS MET program.

The institution responded substantively to all recommendations:

- The Institute's student support services will extend to baccalaureate-level students. BFIT has a Support Our Student alert system that pertains to all students. The baccalaureate-level students will also be reviewed in weekly Students of Concern meetings. Faculty teaching in the upper level MET courses will be provided institutional funding (approximately \$1,200.00) to support attending local and/or national conferences, or other educational opportunities, to support their professional growth.
- The Department Chair and the faculty in the BSMET program will work with the Director of Industry Partnerships in continuing to develop and enhance the program's Industrial Advisory Board. Additionally, the College will work to increase the number of Industry Partners who can collaborate with the MET Department on learning objectives and department outcomes.
- The Institute will pace the rollout of the program in a way that ensures a commitment to high quality pedagogy, curriculum, support services and academic integrity. The Institute will add Chemistry as a prerequisite course for Material Science.
- Professional development opportunities are currently in place for faculty teaching in both the Associate and Bachelor's Degree programs at the College. The College has committed to providing \$1,200.00 in professional development for faculty in both

programs. Additionally, the college will provide up to \$2,000,000 for faculty who take courses or pursue degrees that are a benefit to the institution.

- The Institute will fund the library at the requested amount for the 2014 – 2015 budgetary cycle.

PUBLIC HEARING

The required public hearing was held in the Board of Higher Education office on March 4, 2014.

STAFF ANALYSIS AND RECOMMENDATION

After a thorough evaluation of all documentation submitted, staff is satisfied that the proposal of **Benjamin Franklin Institute of Technology** to award the **Bachelor of Science in Mechanical Engineering Technology** degree meets the criteria set forth in 610 CMR 2.08 (3) in the Degree-Granting Regulations for Independent Institutions of Higher Education, accredited by the New England Association of Schools and Colleges. Recommendation is for approval.

ATTACHMENT A: CURRICULUM OUTLINE

Undergraduate Program Curriculum Outline

Required (Technical Core) Courses in the Major (Total # courses required = 20)		
Course Number	Course Title	Credit Hours
BS220	Introduction to Quality Systems	3
EE214	Electricity and Electronics	4
EE301	Advanced Electromechanical Systems	4
ME105	CAD with SolidWorks	3
ME106	Advanced CAD	3
ME110	Statics	4
ME141	Materials	3
ME150	Introduction to Manufacturing	4
ME151	Manufacturing Processing and CNC	4
ME240	Machine Design with SolidWorks	4
ME250	Advanced Manufacturing and CNC	4
ME252	Thermodynamics	4
ME310	Instrumentation & Controls	3
ME315	Robot Programming and Modeling	4
ME320	Lean Manufacturing	3
ME330	Applied Fluid Mechanics	3
ME345	Materials Science	3
ME352	Advanced Thermodynamics	4
ME426	Manufacturing Design & Management	4
ME495	Senior Design and Manufacture Project	3
	Sub Total Required Credit Hours	71
Technical Elective Courses (Choose 12 credit hours – Total Number of Courses required =3) (attach list of choices if needed)		
ME442	Advanced Machine Design	4
ME455	Heat Transfer	4
ME460	Mechanisms & CAD	4
ME465	Dynamics of Machinery	4
ME470	Metrology	4
ME480	Introduction to Applied Nanotechnology	4
ME491	Workplace Learning in MET	4
	Sub Total Elective Credit hours	Select 12

General Education Courses (Total # courses required =18)		
Distribution of General Education Requirements		# of Gen Ed Credits
EN130	College Composition I	3
EN140	College Composition II	3
EN320	Technical Communications	3
HU/SS	Elective	3
HU/SS	Elective	3
HU/SS	Advanced HU/SS Elective	3
HU/SS	Advanced HU/SS Elective	3
MA120	College Algebra and Trigonometry	3
MA130	Pre-Calculus	3
MA240	Calculus I	4
MA250	Calculus II	4
MA370	Statistics for Engineering Technology	3
MA3XX	Advanced Math Elective	4
PH215	Physics Lab I	1
PH222	University Physics I	3
"PH223	University Physics II	3
PH225	Physics Lab II	1
TS310	General Chemistry	4
Sub Total General Education Credits		54
Curriculum Summary		
Total number of courses required for the degree		41
Total credit hours required for degree		137
Prerequisite, Concentration or Other Requirements: Completion of AS degree in MET (or related field) is required to pursue upper division of BS MET Program.		

ATTACHMENT B: BUDGET PROJECTION

NEW ACADEMIC PROGRAM BUDGET

One Time/ Start Up Costs	Cost Categories	Annual Expenses			
		Year 1	Year 2	Year 3	Year 4
	Full Time Faculty (Salary & Fringe) ¹	\$78,000	\$81,120	\$84,365	\$87,739
	Part Time/Adjunct Faculty (Salary & Fringe)	\$18,085	\$18,809	\$19,561	\$20,343
	Staff	\$24,397	\$42,320	\$46,739	\$49,886
	General Administrative Costs ²	\$65,770	\$114,085	\$125,998	\$134,481
	Instructional Materials, Library Acquisitions	\$5,000	\$3,500	\$1,500	\$1,500
	Facilities/Space/Equipment ²	\$9,313	\$16,874	\$20,882	\$23,833
	Field & Clinical Resources ²	\$9,900	\$17,415	\$20,923	\$23,184
	Marketing	\$6,000	\$6,000	\$6,000	\$6,000
	Other (campus operations) ²	\$42,029	\$72,682	\$82,662	\$85,142
	TOTALS	\$258,494	\$372,804	\$408,630	\$432,108

One Time/Start- Up Support	Revenue Sources	Annual Income			
		Year 1	Year 2	Year 3	Year 4
	Grants				
	Tuition ³	\$326,760	\$571,973	\$711,203	\$813,604
	Fees				
	Departmental				
	Reallocated Funds				
	Other (specify)				
	TOTALS	\$326,760	\$571,973	\$711,203	\$813,604

1. An additional full-time faculty member was added to the MET department this year partly in anticipation of the creation of this program.
2. These values are based on inflation-adjusted per student costs times estimated program enrollments.
3. Tuition revenue includes a 16 percent discount rate.