

BOARD OF HIGHER EDUCATION
REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs

NO: AAC 15-01

COMMITTEE DATE: October 14, 2014

BOARD DATE: October 21, 2014

**APPLICATION OF MASSASOIT COMMUNITY COLLEGE TO AWARD THE
ASSOCIATE IN SCIENCE IN ENGINEERING PROGRAM**

MOVED: The Board of Higher Education hereby approves the application of **Massasoit Community College** to award the **Associate in Science in Engineering**.

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., Director for Educator Policy

BOARD OF HIGHER EDUCATION

October 2014

Massasoit Community College Associate in Science in Engineering

INTENT AND MISSION

The mission of Massasoit Community College (MCC) is to offer a wide range of quality, affordable associate degrees, certificates and short term programs to prepare students for employment and/or transfer to baccalaureate institutions and to promote the development of critical skills.

The intent of the proposed program is to offer students an alternative engineering education covering the first two years of a typical engineering curriculum while providing the atmosphere, student focus and cost advantage of a community college. It is expected that students will be prepared to continue their education, leading them to careers as engineers in the electrical/electronics, structural/mechanical, chemical, and civil engineering fields. Although this program will provide students with skills to work in the technical fields, it will not qualify them for engineering-level occupations. The Division of Emergent Technologies is working to develop programs directly related to jobs and careers in critical demand in the Commonwealth. The proposed program is intended to prepare students for transfer to other institutions to complete an engineering baccalaureate degree in the field of their choice.

The proposed program has obtained all necessary governance approvals on campus and was approved by the Massasoit Board of Trustees on November 13, 2013. The required letter of intent was circulated on February 14, 2014. No comments were received.

NEED AND DEMAND

National and State Labor Market Outlook

According to the March 29, 2012 United States Department of Labor Bureau of Labor Statistics Occupational Outlook Handbook, employment in all engineering careers is expected to have significant positive growth from 2010 to 2020, which is faster than the average for all occupations. High demand in the field is anticipated and expected to continue to grow as firms expand and replace retiring workers. The MA Executive Office of Labor and Workforce Development projects significant growth in jobs for all areas in engineering. This proposal intends to provide a pathway for local residents to fill these vacancies.

Student Demand

There is one other two-year program in the southeast region offering a degree in Engineering. Massasoit expects that there will be an increase in the number of engineering positions becoming available due to growth in the state's STEM industries. Student interest in the proposed engineering has been calculated using Massasoit's

Electronic Technology degree program, which graduated 45 students in 2012 with an Associate's degree in Electronic Technology.

OVERVIEW OF PROPOSED PROGRAM

Massasoit plans that the proposed engineering program will be located in the Division of Emergent Technologies, and supervised by the dean. A department chair is expected to be responsible for academic oversight of the program, and for ensuring that the program meets the transfer standards required by 4-year institutions. An Advisory Board consisting of faculty, alumni and engineers in the industry will be developed for providing additional oversight and input to curriculum development and improvements. It is anticipated that the current administrative staff of the Division of Emergent Technologies will provide administrative support to the program.

Newly developed courses for the proposed engineering program include Statics, Dynamics, Strength of Materials, Engineering Materials, Differential Equations, Intro to Engineering, Engineering Circuit Theory I, and Engineering Circuit Theory II. Two to three faculty positions are recommended to run this program in addition to the current Emergent Technologies and Math and Science staff. Massasoit plans that the academic concentration of this program will need faculty expertise in mechanical and electrical engineering, with teaching skills and an aptitude for cross-engineering interest in areas such as electrical, architectural/structural and either mechanical or environmental engineering.

Duplication

MCC indicates that there are four colleges in southeastern MA that offer Engineering programs. Bristol Community College offers an Associate's degree in Engineering and in 2012 the program graduated 15 students. The University of Massachusetts in Dartmouth offers a Bachelor's degree in Engineering and in 2012 graduated 134 students. Massachusetts Maritime Academy offers a Bachelor's degree in Engineering and in 2012 graduated 125 students. Eastern Nazarene College offers a Bachelor's degree in Engineering and in 2012 graduated 2 students. The proposed Engineering program at MCC has begun the process of articulating curriculum with UMass Dartmouth and will be seeking to form articulation agreements with private institutions as well.

ACADEMIC AND RELATED MATTERS

Admission

It is planned that students entering the proposed engineering program will be admitted under the general admission requirements of Massasoit Community College. The student population is intended to be from 50-100 students in its first year. Students will be recruited from area high schools and additional strategies will be developed in collaboration with the marketing and admissions departments in order to target underrepresented and underserved groups. All students will be required to have a high school diploma or demonstration of high school equivalency (GED or HiSET).

Program Enrollment Projection

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	20	40	40	40
Continuing Full Time	0	17	45	45
New Part Time				
Continuing Part Time				
Totals	20	57	85	85

Curriculum (Attachment A)

In additional to general education requirements, the proposed program plans a total of 32 credits in engineering and chemistry. An internship is not required by the curriculum for this degree program.

RESOURCES AND BUDGET

Fiscal (Attachment B)

A current full time faculty on staff and one additional full-time faculty will be hired before the start of the program. It is planned that one of the faculty members will also serve as the Department Chair and will manage the program and oversee the curriculum.

Massasoit expects that adjunct faculty will be hired to teach additional courses in the program, and are also expected to increase from two in the first two years, to four in the remaining years.

New engineering resources for the library will be purchased, along with supplies needed for the lab courses. Equipment for chemical and mechanical engineering are expected to be purchased for the Canton campus. It is anticipated that a marketing plan during year one will prepare for the opening of the program to the general public. Following an initial campaign, advertising of the program will become a regular part of Massasoit's recruiting program. It is expected that program tuition and fees will generate revenue for the program and that the increase in STEM grants and partnerships with K-12 systems in the area will provide opportunities for students to engage in mentoring and support activities. Massasoit is projecting that the program will become self-sustaining in years 3 and 4, but will require startup funds in the initial two years. Massasoit plans to seek grant funding through private industry and an NSF grant to support the initial startup. Currently there is funding available through the STEM Starter Academy and other STEM-related grants at the College.

Faculty and Administration (Attachment C)

The proposed program is planned to include 2 full-time faculty, 4 part-time faculty, and 1 part-time administrative support person. Faculty for the proposed program will have an earned master's degree in teaching with upper division and/or graduate semester hours and 5 years occupational experience in the field of teaching. It is planned that faculty staffing will be focused on mechanical and electrical engineering courses. Faculty members will also be versed in teaching courses in civil engineering. Chemical engineering courses will be offered through existing science faculty in the Math and Science Department

Facilities, Library and Information Technologies

The Massasoit libraries contain numerous engineering reference books, text and related printed material for students to supplement their understanding of concepts taught in the proposed engineering courses. Multiple examples include areas of engineering analysis, thermodynamics, environmentally conscious mechanical design, mechanics, and statics and dynamics. Many other text resources are available in each of the engineering disciplines and the libraries are continually updated.

It is planned that students will have access to information technologies such as computers, software and internet to support the completion of assignments and research required for each course. Students in this program will have access to computers at a ratio of one per student to perform internet research. Students will be provided with access to MathWorks MATLAB for data analysis and graphical presentation, National Instruments Multisim for circuit design and analysis, instrument supporting software for Mark-10 lab equipment for mechanical analysis, instrument supporting software for PASCO Scientific lab equipment for structural analysis and MicroSoft Office for reports and presentation

Labs: Lab equipment to support all engineering-based courses with labs is being procured based on research of equipment used at transfer target institutions. An existing classroom will be redesigned to accommodate engineering lab benches, equipment and computer requirements as well as proper storage capabilities. Students will be provided with COMSOL software to aid in the simulation and detailed analysis of the structural and thermodynamic characteristics of materials. The program plans to add additional equipment to support course work before the second year, including material grinders, polishers, surface etching stations, and microscopes

Affiliations and Partnerships

The advisory committee for the proposed program is planned to consist of engineering department heads from a sampling of colleges. Advisors will guide Massasoit regarding curricular changes reflective of developments in the field, provide updates to Massasoit regarding transfer students and alignments to baccalaureate program expectations, and provide insights into industry and research trends and directions.

PROGRAM EFFECTIVENESS

Goal	Measurable Objective	Strategy for Achievement	Timetable
Add a structured engineering curriculum that results in an Engineering associate degree to the college offerings	Introduce 15 courses for electrical, mechanical, civil and chemical engineering that meet requirements for an associate's degree and that meet transfer requirements for freshman and sophomore engineering courses at key transfer institutions.	Work with targeted 4-year institutions to align engineering curriculum with their degree requirements and articulate transfer agreements.	In process and will continue with modifications and more agreements in place.
Improve technical standing of institution	Institute at least 4 transfer agreements with 4-year schools, and recruit 4 industry practitioners to serve on an Engineering Advisory Board.	Employ highly qualified engineering teaching staff who will maintain strong relationships with transfer colleges through joint initiatives related to advancing the study of engineering at both institutions, and who will build ties with local industry practitioners.	In process and will continue with coordination of activities with transfer colleges at present and should continue throughout degree offering.
Improve job prospects for students	80% percent of students will transfer into an accredited bachelor degree program and earn an engineering degree that prepares them for immediate employment.	Build relationships with industry partners and trade associations to create work experiences for students and to ensure curriculum aligns with competencies demanded by employers.	Upon start of program and throughout its existence.
Increase overall college enrollment	Attract 50 new students annually into the new engineering degree program who would have pursued engineering at an alternate institution.	Recruit students to the new engineering options by providing new and existing courses that meet transfer and industry standards.	Course development underway and to be completed prior to their start. Marketing of program at large feeder high

			schools has begun and will be expanded upon final approval from the BHE.
Update technical laboratory facilities and equipment	Develop 2 new lab facilities that support the application of program course theory for engineering and technology programs.	Research industry standards and work with 4-year institutions to ascertain necessary equipment to support engineering and technology course material.	This activity has been ongoing and will be completed as necessary according to course schedule.

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed by Dr. Greg Sun, Director of Engineering at the University of Massachusetts Boston and Dr. Ramprasad Balusurbramanian, Associate Dean of the College of Engineering at University of Massachusetts Dartmouth.

The reviewers found that the proposed program is well designed, compatible with the first two years of typical four-year engineering curricula, and provides adequate depth and sequence for a challenging and well-balanced program for entry-level engineering disciplines. The review team suggested minor modifications to curriculum and advised the hiring of two full-time instructors rather than four part-timers. Both reviewers found the attrition predictions to be optimistic and expressed concern that the budgetary needs may be higher than predicted.

The institutional response included agreement to make changes and adaptations to the curriculum. Massasoit's response to the recommendation to increase full-time faculty was to concur that this would be determined by an increase in enrollment. Massasoit holds that the optimism regarding attrition is based on the advising and support resources dedicated to students in STEM programs. It also holds that the smaller class sizes help ensure low attrition.

STAFF ANALYSIS AND RECOMMENDATION

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

ATTACHMENT A: CURRICULUM OUTLINE

Total # Required Courses=4		
Course Number	Course Title	Credit Hours
ENGT	Intro Engineering	4
CHEM	General Chemistry I	4
PHYS	General Physics I	4
PHY	General Physics II	4
	Sub Total Required Credits	16
Elective Courses (Total # courses required = 4) (attach list of choices if needed)		
Course Number	Course Title	Credit Hours
CHEM	General Chem II	4
CHEM	Organic Chem I	5
CHEM	Organic Chem II	5
ENGT	Engineering Circuit Theory I	4
ENGT	Engineering Circuit Theory II	4
ENGT	Engineering Dynamics	4
ENGT	Statics	4
ENGT	Engineering Materials	4
ENGT	Strength of Materials	4
ENGT	Microprocessing and Digital Systems	4
ENGT	Digital Circuits	4
	Sub Total Elective Credits	16
Distribution of General Education Requirements		# of Gen Ed Credits
Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		
Arts and Humanities, including Literature and Foreign Languages – 5 courses ENGL101 Comp I – 3 credits ENGL102 Comp II – 3 credits Humanities Elective – 3 credits Humanities Elective – 3 credits Humanities Elective – 3 credits		15
Mathematics – 4 courses MATH 221 Calculus I – 4 credits MATH 222 Calculus II – 4 credits MATH 223 Calculus III – 4 credits MATH230 Differential Equations – 4 credits		16
Social Sciences – 3 courses		9

SOCI104 Principles of Sociology – 3 credits		
PSYC101 General Psychology – 3 credits		
Social Science Elective – 3 credits		
Sub Total General Education Credits		40
Curriculum Summary		
Total number of courses required for the degree		20
Total credit hours required for degree		72

ATTACHMENT B: BUDGET

<i>One Time/ Start Up Costs</i>	<i>Cost Categories</i>	<i>Annual Expenses</i>			
		<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
	Full Time Faculty (Salary & Fringe)	\$58,500.00	\$119,047.50	\$123,214.17	\$127,526.67
	Part Time/Adjunct Faculty (Salary & Fringe)	\$20,800.00	\$21,528.00	\$43,186.00	\$44,863.44
	Staff				
	General Administrative Costs	\$1,000.00	\$1,100.00	\$1,100.00	\$1,200.00
\$10,000.00	Instructional Materials, Library Acquisitions	\$6,000.00	\$6,000.00	\$6,200.00	\$6,400.00
\$80,000.00	Facilities/Space/Equipment	\$15,000.00	\$15,000.00	\$16,000.00	\$17,000.00
	Field & Clinical Resources				
\$500.00	Marketing	\$1,000.00	\$500.00	\$500.00	\$500.00
	Other (Specify)				
\$100,500.00	TOTALS	\$102,300.00	\$163,175.50	\$190,200.17	\$197,490.11

<i>One Time/Start- Up Support</i>	<i>Revenue Sources</i>	<i>Annual Income</i>			
		<i>Year 1</i>	<i>Year 2</i>	<i>Year 3</i>	<i>Year 4</i>
	Grants				
	Tuition	\$60,840.00	\$173,394.00	\$258,570.00	\$258,570.00
	Fees				
	Departmental				
	Reallocated Funds				
	Other (specify)				
\$5,000.00	TOTALS	\$60,840.00	\$173,394.00	\$258,570.00	\$258,570.00

ATTACHMENT C: FACULTY FORM

Summary of Faculty Who Will Teach in Proposed Program							
Please list full-time faculty first, alphabetically by last name. Add additional rows as necessary.							
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
Wasko, Lawrence MS Electrical Engineering Instructor	<input type="checkbox"/>	<ul style="list-style-type: none"> • (C) Intro to Eng • (C) Crt Theory 1 • (C) Crt Theory 2 	1 1 1	Day Day Day	Full-time	No	Canton
TBD MS Mechanical Engineering, Instructor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Eng Materials • Strength of Matrls • Dynamics • Statics 	1 1 1 1	Day Day Day Day	Full-time	No	Canton
TBD MS Mechanical Engineering, Instructor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Strength of Matrls • Statics 	1 1	Day Day	Part-time	No	Canton
TBD MS Mechanical Engineering, Instructor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Eng Materials • Dynamics 	1 1 1 1	Day Day Day Day	Part-time	No	Canton
TBD MS Electrical Engineering, Instructor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Microprocessing • Digital Circuits 	1 1	Day Day	Part-time	No	Canton
TBD MS Electrical Engineering, Instructor	<input type="checkbox"/>	<ul style="list-style-type: none"> • Circuit Theory I • Circuit Theory II 	1 1	Day Day	Part-time	No	Canton