BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs   **NO**: AAC 16-32

                                            COMMITTEE DATE: June 7, 2016

                                                   BOARD DATE: June 14, 2016

APPLICATION OF MASSACHUSETTS BAY COMMUNITY COLLEGE TO AWARD THE ASSOCIATE IN SCIENCE IN CYBERSECURITY

MOVED: The Board of Higher Education hereby approves the application of **Massachusetts Bay Community College** to award the **Associate in Science in Cyber Security.**

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

June 2016
Massachusetts Bay Community College
Associate in Science in Cyber Security

INTENT AND MISSION

The mission of Massachusetts Bay Community College (MBCC) includes preparing students for local and global citizenship, and anticipating and responding to the needs of surrounding communities, while contributing to the region's economic development. The proposed Associate in Science in Cyber Security (AS/CS) program is intended to prepare network and information security technicians by providing students with skills to identify, communicate, manage and mitigate risks to computer networks and information security. The proposed degree is designed to enable students to be employed as technicians and as specialists in the growing security sector both here in Massachusetts as well as in the larger region and nation.

The AS/CS program proposes to provide knowledge and technician training for aspects of cyber security such as networking, information assurance, security of operating systems, and web security. It is also intended to be aligned with computer science course and program articulations with several other public institutions of secondary and higher education, such as University of Massachusetts Amherst, University of Massachusetts Boston and Framingham State University. It is expected that some core and elective courses will articulate with some regional K-12 school partners including Keefe Technical High School and Framingham High School.

The proposed program has obtained all necessary governance approvals on campus and was approved by the Massachusetts Bay Community College Board of Trustees on June 9, 2015. The required letter of intent was circulated on July 21, 2015. No comments were received.

NEED AND DEMAND

National and State Labor Market Outlook

MBCC cited a National Institute of Standards and Technology (NIST) report[1] indicating a well-documented shortage of general cyber security technicians and experts who have an understanding of the challenges posed to particular parts of critical infrastructure. MBCC noted that, according to a recent Burning Glass report, nationally the cyber security sector added jobs at more than double the rate of all information technology jobs. MBCC reports that in 2013, there were 209,749 postings for cyber security related positions nationally and the number of jobs in cyber security in the state alone have risen nearly 76% between 2007 and 2013.

Student Demand

An increased number of students are enrolled in computer networking and security courses offered by the MBCC computer science department. In addition, the *College and Career*

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[1] *National Institute of Standards and Technology (NIST), (2014) NIST Roadmap for Improving Critical Infrastructure Cybersecurity. Retrieved on April 01, 2016 from http://www.nist.gov/cyberframework/upload/roadmap-021214.pdf*

Navigator[2] indicated an increased interest in cyber security careers among displaced and disadvantaged adult workers served by the region's One-Stop Career Centers.

OVERVIEW OF PROPOSED PROGRAM

In alignment with its mission to respond to regional needs, MBCC started laying the groundwork for the cyber security degree program in AY 2012 when first developing two short-term certificate programs in cyber security. The programs prepared students with the knowledge, skills, and abilities needed for entry-level security and networking positions.   MBCC students completing the cyber security certificate program won recognition and prizes in national competitions and have earned internships and jobs in the field. Some of the employers who have hired the cyber security certificate completers include the MA Attorney General's Office, Tech-Boston, TowerWall, and Commonwealth Financial Network. These successes in addition to continued industry engagement, led to the development of an outline for the proposed degree program in AY 2014. The proposed AS/CS program is aligned with the National Cyber Security Workforce Framework of the National Institute of Standards and Technology , distinguishing it as the first AS program of its' kind in Massachusetts.

Duplication

Middlesex Community College has similar AS programs, the Secure Software Development Concentration, and Information Technology Cyber Security. Bunker Hill Community College offers an AS in Information Technology with a Security option. The University of Massachusetts at Amherst's College of Information and Computer Sciences offers a concentration in Security & Privacy. Worcester Polytechnic Institute offers no formal concentration in cyber security at the undergraduate level. However, there are courses and opportunities for undergraduate students to create a security focus.

ACADEMIC AND RELATED MATTERS

Admission

The proposed program is consistent with MBCC open enrollment policy, which accepts all students who have earned a high school degree or a high school equivalency. Students may transfer credits earned at other institutions by completing an application and providing an official high school transcript, or G.E.D. equivalency with the transcripts from other colleges they attended. All admitted students take the Accuplacer test to help determine the levels of math and English that are appropriate for study. The Academic Achievement Center also offers free workshops to all admitted students to help them prepare for the Accuplacer test in math, reading, and/or writing.

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[2]*Since 2014, the College has actively participated in a consortium of community colleges funded by the Department of Labor Trade Adjustment Assistance Community College and Career Training Grant Guided Pathways to Success in Science, Technology, Engineering, and Math (GPSTEM) grant. The College's GPSTEM project has created two new positions: a GPSTEM Director and a College and Career Navigator. The College and Career Navigator plays an active role in recruitment and enrollment of Trade Adjustment Assistance and other dislocated workers, guiding their decisions about career pathways and related courses, as well as connecting them to the College's Career Services.*

PROGRAM ENROLLMENT

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4
New Full-Time	10	10	11	12
Continuing Full-Time		10	13	15
New Part-Time	10	10	11	12
Continuing Part-Time		10	15	19
Totals	20	40	50	58

Curriculum (Attachment A)

The purpose of the proposed AS/CS program is to prepare students with an academic and technical foundation in computing and mathematics and to offer a new technical track for community college students. The program is expected to provide requisite knowledge and technical training for several important aspects of cyber security including networking, information assurance, security of operating systems, and web security. MBCC plans that the proposed program will offer relevant curricula for academic and career preparation of diverse students entering the cyber security field.

Internships or Field Studies

Students in the proposed program will be advised, coached, and guided to work on extracurricular projects, to seek internships, and to prepare for job placement by the STEM faculty and staff. The MBCC's *Technology Internship Program* is offered every semester and it is expected that students from the Cyber Security degree program will be eligible for internships in the security field. Additionally, once the program is approved it is planned that MBCC's IT department may hire Cyber Security students as interns.

RESOURCES AND BUDGET

Fiscal (Attachment B)

MBCC expects that the proposed program will require approximately $35.5K to operate. Expenses are planned to cover marketing, professional development and course releases for program faculty, adjunct faculty, program coordination activities and collaborations with related departments. Revenues generated in tuition and costs are expected to compensate for initial program costs.

Faculty and Administration (Attachment C)

Three full-time faculty members in the computer science department and two existing adjunct faculty members are planned to teach core program courses.   Full-time and adjunct faculty with

advanced degrees in computer science or related fields are qualified to teach a number of courses in a variety of delivery formats including online, online hybrid and traditional. MBCC does not anticipate new faculty hires to be required at the outset to the program. Once projected enrollment and stabilization of the program is achieved, MBCC plans for a dedicated full-time faculty position in Year 3. It is planned that MBCC STEM division administrative staff will continue to provide standard administrative assistance to adjunct and full-time faculty in the program.

Facilities, Library and Information Technologies

MBCC offers access to relevant electronic journals and books through Minuteman Library Network. The MBCC Libraries' collection contains over 45,000 books/eBook and more than 20,000 print periodicals, magazines and newspapers in both print and electronic format. MBCC maintains an updated information technology infrastructure, and provides access to Blackboard. The IT department provides in-person and online help and curricular support to students, faculty and staff upon request.

MBCC's Wellesley campus currently hosts eight computer laboratory rooms, each having between 24 and 30 computers with prominent operating systems such as Windows and Linux. These labs are equipped with instructor stations that have projection and multimedia capability.

The Wellesley campus also hosts three dedicated laboratory rooms for computer science courses. The laboratory spaces are designed to host eighteen to twenty-four computers each, and are appropriately furnished to engage students in curricular and extracurricular activities. The security laboratory provides virtual access to multiple operating systems and network environments. The configuration of this lab allows MBCC to run multiple courses in one semester.

New acquisitions for networking and security courses include a new NETLAB+ Professional Edition license: this is a perpetual license that enables the College to host real IT equipment, virtual machines, and lab content on the Internet to support IT training. The NETLAB+ environment supports a maximum of 20 simultaneous PODs. A POD is a virtual environment that makes hands-on learning possible without endangering a physical network. Each student is expected to have access to a dedicated virtual environment during pre-defined time slots using NETLAB+ scheduling feature.

The Cisco laboratory is a new state-of-the-art Cisco Networking Academy lab. The College has been an authorized provider of CISCO networking classes as a Cisco Networking Academy since AY 2013. This laboratory houses networking hardware such as high performance campus LAN switches (Cisco Catalyst Series 2960) and routers (Cisco 1941 Integrated Services Router), as well as Cisco/Linksys wireless access routers, servers, network testing equipment, tablets, and simulation equipment. MBCC anticipates that these resources will provide students with hands-on experience and access to their own switches and routers during lab time. The third laboratory space features a dual-boot configuration for all computers so that both Windows and Linux operating systems are available. This room also supports much of the multimedia software required by the department's web-related and digital-imaging courses.

Affiliations and Partnerships

MBCC plans that students will generally be able to transfer a majority of their academic credits through existing transfer agreements at four-year institutions, but specific articulation agreements in cyber security have yet to be developed. Some program courses may not be transferrable, but efforts such as the Broadening Advanced Technological Educational Connections (BATEC) at the University of Massachusetts Boston, that has partnered with MBCC and other community colleges to build programs that facilitate clear, articulated pathways in cyber security and are expected to create the framework for future transfer/articulation agreements.

MBCC is currently working with community and non-profit partners such as Jewish Vocational Service, veterans' groups and the National Center for Women in Information Technology to expand its outreach to women, minorities, individuals with disabilities and other under-served groups.   MBCC maintains connections with local workforce investment boards and community partners and is actively reaching out to under-employed and unemployed workers, as well as constituencies who are traditionally under-represented in the STEM fields. MBCC has a cyber-security advisory committee that advocates for the college's cyber security program with employers and assists the MBCC divisional dean and faculty in securing resources. The advisory committee is expected to meet twice a year regarding issues of importance to the program and to make recommendations as appropriate and necessary.   A complete list of advisors and their affiliations was included in the proposal.

PROGRAM EFFECTIVENESS

Goal	Measurable Objective	Strategy for Achievement	Timetable
Prepare students for entry-level jobs in cyber security	Job or internship placement numbers	Offer rigorous core curriculum and career preparation opportunities for students	2 years
Prepare students for transferring to a four-year institution	Transfer Statistics	Offer rigorous general education and program courses	2 years
Prepare students with critical thinking and ethical standards required for successful entry into a cyber security career	Student performance on assessments, quality of artifacts and capstone work produced, and demonstrated awareness of ethical concerns in the field of cyber security	Embed critical thinking in all courses. Offer coursework in ethics, familiarize students with practical and theoretical issues and provide opportunities for application of skills and knowledge to make good decisions	2 years

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The program was reviewed by Dr. Margaret Leary, a Professor at Northern Virginia Community College and Director of Curriculum for the National CyberWatch Center, an NSF-funded National Center focused on developing cyber security educational standards; Dr. Tanya Zlateva, Dean of Boston University's Metropolitan College and Director of Cyber Security Programs. Mr. Kevin Burns, Commonwealth Chief Information Security Officer at the Executive Office for Administration and Finance, MassIT, the states lead agency for technology and innovation, also reviewed the program.

The reviewers generally agreed that the networking courses, database and Linux course, and access control course are important for the preparation of the students for careers in cyber security. They also agreed that the proposed curriculum provides a good depth vs. breadth balance with 12 courses in computer science and computer security, building strong professional knowledge. The remaining seven courses in the humanities, social sciences, and mathematics were seen as providing a strong foundation for general knowledge. Reviewers have noted considerable alignment with both national cyber security education standards as well as with industry certifications.

One reviewer suggested specifying a list of general education courses that are of high interest in the cyber security field rather than offering several electives. MBCC responded that the interdisciplinary nature of the proposed program intentionally informed a wider range of choices for students, but a list of suggestions related to the cyber security field could be of benefit to some students.

STAFF ANALYSIS AND RECOMMENDATION

Staff thoroughly reviewed all documentation submitted by the Massachusetts Bay Community College and the external reviewers. Staff recommendation is for approval of the proposed **Associate in Science in Cyber Security.**

ATTACHMENT A: CURRICULUM

Required (Core) Courses in the Major (Total # courses required =11)		
Course Number	Course Title	Credit Hours
CS 110	Introduction to Computer Science	4
CS 118	Scripting	3
CS 180	Intro to Operating Systems	3
CS 116	Fundamentals of Cyber Security	3
CS 242	Computer Networks	4
CS 141	Linux Management	3
CS 243	Computer Networks II	4
CS 117	Cyber Ethics	3
CS 247	Perimeter Defense	3
CS248	Securing Access	3
CS 281	Capstone Experience	3
	Sub Total Required Credits	36

Elective Courses (Total # courses required = 5) *(attach list of choices if needed)*		
[Course Number]	Program Elective (see attached)	3/4
[Course Number]	Program Elective (see attached)	3/4
[Course Number]	Humanities/Social Science	3
[Course Number]	Humanities/Social Science	3
[Course Number]	Humanities/Social Science	3
	Sub Total Elective Credits	15/17

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	9
Mathematics and the Natural and Physical Sciences	3
Social Sciences	
Sub Total General Education Credits	12

Curriculum Summary	
Total number of courses required for the degree	20
Total credit hours required for degree	63/65
Prerequisite, Concentration or Other Requirements:	

ATTACHMENT B: BUDGET

One Time/ Start Up Costs		Annual Expenses			
	Cost Categories	Year 1	Year 2	Year 3	Year 4
None. 3 existing FT faculty positions serve 3 A.S. degree programs such as CS, CIS and will serve the proposed program in Cyber-Security for the first two years. In year 3, 1 new FT faculty positions will be requested.	Full Time Faculty *(Salary & Fringe)*			$90,000 with benefits	$90,000 with benefits
$18,000	Part Time/Adjunct Faculty *(Salary & Fringe)*	$18,000	$18,000	$18,000	$18,000
	Staff	$7,500	$7,500	$7,500	$7,500
	General Administrative Costs	$9,000	$9,000	$9,000	$9,000
	Instructional Materials, Library Acquisitions			$1,000	$1,000
	Facilities/Space/Equipment		$15,000	$15,000	
	Field & Clinical Resources				
	Marketing	$1,000	$1,000	$500	$500
	Other (Specify)				
	TOTALS	$35,500	$50,500	$141,000	$126,000

One Time/Start-Up Support		Annual Income			
	Revenue Sources	Year 1	Year 2	Year 3	Year 4
	Grants	$17,000 (DHE grant for transfer and curriculum alignment with other institutions)			

	Tuition	$9,216	$16,896	$20,582	$23,501
	Fees	$66,816	$122,496	$149,222	$170,381
	Departmental				
	Reallocated Funds				
	Other (specify)				
	TOTALS	$76,032	$139,392	$169,805	$193,882

ATTACHMENT C: FACULTY

<table>
<tr><td colspan="8">Summary of Faculty Who Will Teach in Proposed Program</td></tr>
<tr><td colspan="8">Please list full-time faculty first, alphabetically by last name. Add additional rows as necessary.</td></tr>
<tr>
<th>Name of faculty member (Name, Degree and Field, Title)</th>
<th>Check if Tenured</th>
<th>Courses Taught Put (C) to indicate core course. Put (OL) next to any course currently taught online.</th>
<th>Number of sections</th>
<th>Division of College of Employment</th>
<th>Full- or Part- time in Program</th>
<th>Full- or part-time in other department or program (Please specify)</th>
<th>Sites where individual will teach program courses</th>
</tr>
<tr>
<td>Moussavi, Shamsi

M.S. in Computer Science

Professor</td>
<td>×</td>
<td>●CS 180 (HB)
●CS 116 (OL)
●CS 106 (OL)</td>
<td>(0)
(3)
(3)</td>
<td>STEM</td>
<td>Full-time</td>
<td>No</td>
<td>●Main Campus (Wellesley Hills)</td>
</tr>
<tr>
<td>Sena, Giuseppe

M.S. Computer Science

Assistant Professor</td>
<td>☐</td>
<td>●CS 242
●CS 243
●CS 141</td>
<td>(6)
(6)
(6)</td>
<td>STEM</td>
<td>Full-time</td>
<td>No</td>
<td>●Main Campus (Wellesley Hills)</td>
</tr>
<tr>
<td>Steiger-Escobar, Susanne

M.S. Computer Science

Professor and Department Chair</td>
<td>×</td>
<td>●CS 110
●CS 118 (OL)</td>
<td>(10)
(6)</td>
<td>STEM</td>
<td>Full-time</td>
<td>No</td>
<td>●Main Campus (Wellesley Hills)</td>
</tr>
<tr>
<td>Clifford, Gary

Masters in</td>
<td>☐</td>
<td>●CS 118 (1)</td>
<td>[0]</td>
<td>STEM</td>
<td>Part-time</td>
<td>No</td>
<td>●Main Campus (Wellesley Hills)</td>
</tr>
</table>

Information Management and Software Engineering Adjunct Faculty							
5 new adjunct faculty M.S. in Computer Science Adjunct Faculty	☐	●CS 117 ●CS 247 ●CS 248 ●CS 281 ●CS Elective	[0]	STEM	Part-time (adjunct)	No	●Main Campus (Wellesley Hills)