

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

**COMMITTEE:** Academic Affairs

**NO:** AAC 15-25

**COMMITTEE DATE:** January 20, 2015

**BOARD DATE:** March 10, 2015

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**APPLICATION OF BUNKER HILL COMMUNITY COLLEGE TO AWARD THE  
ASSOCIATE IN SCIENCE IN ENVIRONMENTAL SCIENCE**

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

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., Assistant Commissioner for Academic and Educator Policy

## BOARD OF HIGHER EDUCATION

January 2015

### Bunker Hill Community College Associate in Science in Environmental Science

#### INTENT AND MISSION

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

The intent of the proposed Associate in Science in Environmental Science (ASES) is to offer students an academic bridge to a Bachelor of Arts or Bachelor of Science in Environmental Science or Environmental Studies, 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 and electronics, structural and mechanical, chemical, and civil engineering fields. This program is designed to provide students with skills to work in technical fields, but it will not qualify them for engineering-level occupations. The proposed program is also intended to prepare students for transfer 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 Bunker Hill Board of Trustees on June 23, 2014. The required letter of intent was circulated on July 9, 2014. No comments were received.

#### NEED AND DEMAND

##### *National and State Labor Market Outlook*

A feasibility and needs assessment for the proposed ASES degree was prepared in the summer of 2013<sup>1</sup> to evaluate the need for such a program at BHCC. The feasibility study analyzed career pathways in three areas: 1) Clean Energy and Sustainability; 2) Wildlife Preservation and Conservation; and 3) Environmental Assessment and Remediation. Included in the study were the national and regional jobs outlook as well as preferred industry skills and credentials. The feasibility study also evaluated other Environmental Science and Environmental Studies programs in Massachusetts at the 2-year and 4-year level.

Data from US Bureau of Labor Statistics and the Massachusetts Executive Office of Labor and Workforce Development were evaluated to determine overall industry growth trends in Massachusetts. The feasibility study also reviewed reports such as the PEW Charitable Trust's *Clean Energy Economy Report: Massachusetts 2011*, Association of Energy Engineers *Survey of Green Energy Industry (2011)*, Bunker Hill Community College's *2011 Green Energy Job Sector Forecast*, and Massachusetts Clean Energy Center *2013 Clean Energy Industry Report* with regards to overall trend predictions in green job growth in Massachusetts. Finally, interviews were conducted with six area environmental firms and a survey of nearly 50 job

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<sup>1</sup> BHCC Feasibility Study for Environmental Science Degree

postings across several environmental disciplines was conducted to determine skill demands by employers.

BHCC reports that that 67% of all energy professionals expect a heightened shortage of qualified professionals in the energy efficiency and renewable energy fields in the next five years<sup>2</sup>. It is also reported that 72% of energy professionals identified a need for training programs to address job shortages that are impairing growth in green industries. The Massachusetts Clean Energy Center's *2012 Clean Energy Industry Report* surveyed over 1,000 respondents about clean energy jobs in Massachusetts. Their findings indicate that in 2011 Massachusetts was home to over 4,900 clean energy firms and employed more than 70,000 people in clean energy jobs. The report further indicated that growth rate in the clean energy sector between 2011 and 2012 was 11.2%.

### *Student Demand*

BHCC expects that student demand will result from the projected increase in the number of environmental science positions becoming available in the state's STEM and environmental science industries. In addition, BHCC calculated student interest in the proposed program using enrollment numbers from BHCC's Energy and Sustainability Management certificate, which students are expected to utilize as a pathway to obtaining the ASES.

## **OVERVIEW OF PROPOSED PROGRAM**

Environmental positions in Massachusetts seek candidates with bachelor degrees, therefore the ASES degree is expected to provide a pathway for transfer to four-year environmental science programs. The ASES also seeks to provide students with the strong foundation in STEM skills sought by employers. The program is planned to provide the foundations for understanding physical and life sciences in order to understand interactions within environmental systems. It is also designed to enable students to be able to delineate the nature and extent of environmental problems; how ecological considerations fit within the context of complex economic and political systems; and how to work with engineers, technologists, policy makers and managers to spur the development of environmentally sustainable practices and policies. The proposed ASES seeks to develop students with competencies in environmental literacy, scientific inquiry, and critical analysis,

### *Duplication*

BHCC indicates that there are two colleges in the Boston area that offer an ASES or similar program. Roxbury Community College offers an Associate's degree in Ecology and Environmental Science and Dean College offers an ASES.

## **ACADEMIC AND RELATED MATTERS**

### *Admission*

Admissions requirements for the proposed program are planned to be the same as BHCC's general admissions requirements. Students must be admitted to the College and possess a high school diploma or GED. Students must meet individual course prerequisites as outlined in

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<sup>2</sup> The *2011 Survey of Green Energy Industry* prepared by the Association of Energy Engineers

the College's catalog including Writing Skills, Academic Writing, a minimum grade C in Foundations of Mathematics, and Reading Skills or placement equivalency.

### Program Enrollment Projection

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full Time	15	15	15	15
Continuing Full Time	0	12	12	12
New Part Time	15	15	15	15
Continuing Part Time	0	12	12	12
Totals	30	54	54	54

#### *Curriculum (Attachment A)*

The proposed ASES program is designed to provide a bridge to a baccalaureate degree in Environmental Science or Environmental Studies. It is also planned to be a stackable program of study that includes a Certificate in Energy and Sustainability Management. The proposed program curriculum is designed to align with degree requirements for four-year colleges and universities such as University of Massachusetts Boston and Lowell. Environmental literacy objectives for the proposal were drafted based on *Environmental Literacy Framework*<sup>3</sup> developed by the National Oceanic and Atmospheric Administration's Office of Education. The proposed curriculum for the environmental science degree program was vetted through internal and external reviewers including an industry advisory board.

#### *Internships and Fieldwork*

Internships for credit are planned to fulfill a career elective in the proposed ASES program. Students will be required to obtain ASES faculty approval for credit bearing internships. It is planned that students will work with the BHCC Internship Coordinator and Career Services to locate appropriate internship sites and assure that all appropriate documentation is in place. A faculty member will administer the internship course and oversee the student's progress in the internship.

### RESOURCES AND BUDGET

#### *Fiscal (Attachment B)*

Annual expenses for full time faculty are incorporated into the annual budget for the Division of Science, Engineering, and Health Programs. Expenses for the three full time faculty are independent of the addition of the proposed ASES degree. In the first year, it is projected that the new program will need to procure laboratory supplies, consumables, and teaching materials. BHCC has estimated these expenses based on start-up costs for other science

<sup>3</sup> Environmental Literacy Framework, National Oceanic and Atmospheric Administration Office of Education, 2009  
[http://www.andrill.org/education/ELF\\_EP.pdf](http://www.andrill.org/education/ELF_EP.pdf)

programs that have been instituted at the college. All science courses with a laboratory component at BHCC are supported by the annual budget. An estimate of \$500 is assumed for the cost of printing marketing materials to advertise the new program. Program revenue other than student lab fees for all science courses is provided by the Northeast Resiliency Consortium.

#### *Faculty and Administration (Attachment C)*

BHCC has committed human resources to implement the proposed ASES program. Currently, three full-time tenured or tenure track professors of Environmental Science are employed by BHCC. One of these professors will serve as the Program Director. Dedicated full-time faculty in allied science and math courses are also employed by BHCC. It is expected that existing adjunct faculty for Environmental Science and Energy and Sustainability Management courses will teach specialized and general courses in the ASES program.

#### *Facilities, Library and Information Technologies*

BHCC dedicated a laboratory and preparatory room to be used by the Environmental Science and Energy and Sustainability Management programs. Equipment for new courses developed for the Environmental Science degree has been funded under the grant awarded by the U.S. Department of Labor's Trade Adjustment Assistance Community College Career and Training (TAACCCT) program to the Northeast Resiliency Consortium (NRC). Supplies and consumables for environmental science courses are assumed in the budget of the Science and Engineering Department.

#### *Affiliations and Partnerships*

BHCC has established partnerships and relationships with area employers and academic institutions to support the ASES program and to provide opportunities for students. An external advisory board is in place to provide program feedback and input for both the proposed ASES program and the existing Energy and Sustainability Management Certificate. The Advisory provides feedback on program's curriculum and resources with respect to the demands and expectations of the labor market; advises on the perceived effectiveness of curriculum; provides assistance in locating internship and employment opportunities, and support in public relations efforts to engage community support and involvement. The advisory also serves as a critical link between BHCC and the external community by providing guidance specific to environmental science, sustainability, clean energy and green building industries; perspectives on workforce preparation; assessments of employer needs; and assessment and review of the environmental sciences programs. A list of advisory board members was included in the proposal.

The environmental science faculty at BHCC, met with the Dean of School for the Environment at UMass Boston, and the faculty from the Environmental, Earth and Atmospheric Sciences department at UMass Lowell to plan articulation agreements for the proposed program. BHCC is expected to be a strong feeder program for these institutions. The Massachusetts Department of Environmental Protection has provided BHCC with a letter of support for the program. Additionally, the environmental, sustainable, and clean energy sectors in Boston are reported to be knowledgeable of BHCC's Energy and Sustainability Management Certificate program and its' internship requirement.

## PROGRAM EFFECTIVENESS

Goal	Measurable Objective	Strategy for Achievement	Timetable
Sustainable recruitment of new students	30 students enrolling or continuing in program each year	Leverage partnerships with One-Stop career centers, Community Based Organizations, and BHCC Admissions to assist in recruiting new students.  Utilize general education science courses as a recruiting source.	Annually
Student retention	Retain 80% of enrollees	Establish a support network for students including course instructors, advisors, LifeMap Center counselors, and tutors  "Energy, Life, and Sustainability" a Learning Community Seminar, for first year students incorporates student success strategies contextualized for sustainability.  Work with English, math, and ESL professors to support sustainability themed or contextualized developmental courses.	Support networks, Learning Community Seminar, and contextualized developmental courses are already in place.
Students meet learning objectives outlined in courses and program	Performance in course tests, lab assignments, written assignments.	Utilize e-Portfolios for students to showcase their work from courses.	By Year two
Graduates demonstrate work readiness	Graduates demonstrate professionalism, good judgment, and communicate well.  Graduates demonstrate ability to search for and apply to jobs.	Observation of professional maturity in project-based courses, internship review, or independent study.  Dedicated modules in courses on environmental careers and preparing for environmental careers.  Require resume and cover letter development as part of courses	Year one
Job and Internship Placement	Number of students utilizing career services from BHCC.  Number of students completing internships.  Post graduation employment within one year.	Leverage existing partnerships with BHCC Career and Internship Office.  Connect students to support networks early on.  Assist and advise students in developing their career goals and pathways.  Build a network of area employers interested in working with our program/students.	By Year Two
Streamline existing Environmental Science lab curriculum	Courses across Environmental Science have adequate breadth and depth of topics and skill objectives without overlap.	Faculty will review and update current course materials.  Faculty will meet periodically to strategize streamlining process and share best practices	By Year One
Faculty Professional Development	Certifications gained  Professional conference presentations and participation	Faculty will outline professional development goals with Dean of Science, Engineering, and Health Programs.	Annually
Development of a resource library and dedicated lab equipment	Dedicated space and materials purchased.	Purchasing and space use to be coordinated with Science and Engineering Department.	Year Two

Real-world simulations and training in classroom.	Students demonstrate ability to use tools and techniques common in industry.  Students demonstrate ability to evaluate and analyze problems based on real projects or problems.	Program Director will work with faculty to develop problem-based learning projects.  Faculty will develop activities aimed to facilitate development of industry demanded skills and competencies.	Annually
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## EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed by Alan Christian, Ph.D., Associate Professor and Director of the Environmental Studies Program at the University of Massachusetts Boston and Judith Underwood, Senior Special Program Coordinator for Renewable Energy in the Environmental Technology program at Cape Cod Community College.

The review team found the proposal to be sound with a coherent design and appropriate faculty and institutional resources. The overall program's design was described as accomplishing its goals and purposes with an appropriate course content and sequencing and balance among the various components. One reviewer noted that the degree requirements follow a STEM based curriculum which is readily used across the Commonwealth and applied by articulating institutions. There was the suggestion of broadening capacity to offer both an AA and the AS degree and to consider a change to one course in order to provide a capstone experience for students. The reviewers also questioned the student assessment strategy.

BHCC responded to the suggestions pointing out that the decision to offer only the AS was in order to strengthen transfer and career options for students. In terms of the course adjustment BHCC responded that the particular course in question also serves as a science requirement for non Environmental Studies majors, thus the reticence to change it. BHCC expects that it will offer numerous opportunities for students in the program to engage in internships or an honors seminar as a capstone experience. Finally BHCC underscored the college wide Student Learning and Outcomes Assessment Program (SLOAP) as the strategy for all student assessment and across all disciplines. Faculty representatives from each academic department serve as SLOAP taskforce members and review program assessment across BHCC.

## STAFF ANALYSIS AND RECOMMENDATION

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

## ATTACHMENT A: CURRICULUM OUTLINE

<b>Required (Core) Courses in the Major (Total # courses required = 9)</b>		
Course Number	Course Title	Credit Hours
ENV105	Environmental Science I	4
ENV110	Sustainable Resource Conservation	4
ENV111	Survey of Renewable Energy	4
MAT181	Statistics	3
GIS124	Geographic Information Systems	4
CHM201	General Chemistry I/Lab	4
CHM202	General Chemistry II/Lab	4
BIO195 OR PHY201	General Biology I/Lab OR General Physics I/Lab	4
BIO196 OR PHY202	General Biology II/Lab OR General Physics II/Lab	4
	<b>Sub Total Required Credits</b>	35
<b>Option Elective Courses-Choose 2 (Total # courses required = 2 ) (attach list of choices if needed)</b>		
ENV115	Earth Science/Lab	4
ENV113	Oceanography/Lab	4
ENV106	Environmental Science II/Lab	4
BIO210	Population Ecology	4
BIO211	Environmental Microbiology	4
	<b>Sub Total Elective Credits</b>	8
<b>Career Elective Courses (Total # courses required = 2 ) (attach list of choices if needed)</b>		
	<i>See list of career elective options</i>	
	<b>Sub Total Elective Credits</b>	6-8
<b>Distribution of General Education Requirements</b> Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		# of Gen Ed Credits
Area 6 – Humanities Menu		3
Mathematics and the Natural and Physical Sciences		Requirement met by program
Area 2- Individual and Society Menu		3
Area 3- World View Menu		3
College Writing I		3
College Writing II		3

<b>Sub Total General Education Credits</b>		15
<b>Curriculum Summary</b>		
Total number of courses required for the degree	18	
Total credit hours required for degree	64-66	
<b>Prerequisite, Concentration or Other Requirements:</b>		
See attached draft Catalog Page and Program Grid for course prerequisites and list of career electives.		

**ATTACHMENT B: BUDGET**

<i>One Time/ Start Up Costs</i>	<i>Cost Categories</i>	<i>Annual Expenses</i>			
		<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>
	Full Time Faculty (Salary & Fringe)				
	Part Time/Adjunct Faculty (Salary & Fringe)				
	Staff				
	General Administrative Costs				
	Instructional Materials, Library Acquisitions	\$31,600	\$4,000	\$4,000	\$4,000
	Facilities/Space/Equipment				
	Field & Clinical Resources				
	Marketing	\$550			
	Other (Specify)				
	<b>TOTALS</b>	\$32,150	\$4,000	\$4,000	\$4,000

<i>One Time/Start- Up Support</i>	<i>Revenue Sources</i>	<i>Annual Income</i>			
		<b>Year 1</b>	<b>Year 2</b>	<b>Year 3</b>	<b>Year 4</b>
	Grants	\$20,850	\$8,900	\$8,900	
	Tuition				
	Fees				
	Departmental				
	Reallocated Funds				
	Other (specify)				
	<b>TOTALS</b>	\$20,850	\$8,900	\$8,900	

**ATTACHMENT C: FACULTY FORM**

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.	# 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
Reichert, Krista MS, Earth and Environmental Science Assistant Professor	<input type="checkbox"/>	<ul style="list-style-type: none"> <li>• ENV110 (C) (OL)</li> <li>• ENV111 (C)</li> <li>• ESM211</li> </ul>	(2) (1) (1)	Science, Engineering, and Health Programs	Fulltime	Yes Energy and Sustainability Management, History and Social Sciences	• Charlestown
Frashure, Kim Ph.D Candidate, Oceanography Assistant Professor	<input type="checkbox"/>	<ul style="list-style-type: none"> <li>• BIO105</li> <li>• ENV105 (C)</li> <li>• ENV111 (C)</li> </ul>	(1) (2) (1)	Science, Engineering, and Health Programs	Fulltime	Yes Yes Energy and Sustainability Management, History and Social Sciences	• Charlestown
Benjamin, Scott Ph.D Candidate, Environmental Science Associate Professor	x <input type="checkbox"/>	<ul style="list-style-type: none"> <li>• BIO105</li> <li>• BIO106</li> <li>• BIO206</li> <li>• ENV106</li> </ul>	[0]	Science, Engineering, and Health Programs	Fulltime	[Yes/No] No	• Charlestown