BOARD OF HIGHER EDUCATION

REQUEST FOR COMMITTEE AND BOARD ACTION

COMMITTEE: Academic Affairs **NO**: AAC 16-12

COMMITTEE DATE: January 19, 2016

BOARD DATE: January 26, 2016

APPLICATION OF BRISTOL COMMUNITY COLLEGE TO AWARD THE ASSOCIATE IN SCIENCE IN LIFE SCIENCES

MOVED: The Board of Higher Education hereby approves the application of **Bristol Community College** to award the **Associate in Science in Life Sciences**

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

January 2016

Bristol Community College
Associate in Science in Life Sciences

INTENT AND MISSION

The proposed associate degree program in Life Sciences (ASLS) is intended to align with the mission of the college to be the leading resource for education and workforce development in southeastern Massachusetts. It is intended that the program will prepare graduates for immediate employment in the job market or to transfer to a bachelor's degree granting institution. It is also intended to increase enrollment and completion, to expand career pathways through alignment with the life science industry in the region, and to close access gaps by recruiting, retaining and graduating students from underserved groups.

This program is designed to have two Concentrations, Biotechnology and Forensics DNA (BF/DNA), and Biology. It is intended that the BF/DNA Concentration will prepare students to address a local workforce shortage and the Biology concentration will prepare students to transfer to a 4-year baccalaureate degree program. The purpose of the BF/DNA Concentration is to provide well-trained and educated biotechnicians for the growing biotechnology workforce. It is intended that graduates will qualify for entry-level lab positions. It is also expected to provide a springboard for transfer into a four-year STEM degree. The Biology Concentration is designed for students who plan to transfer to a baccalaureate institution and major in biology or another life science field. The goal is to provide students with the necessary skills and background to continue on an academic pathway and to a baccalaureate institution upon completion of the degree.

The proposed program has obtained all necessary governance approvals on campus and was approved by the Bristol Community College Board of Trustees on May 5, 2014. The required letter of intent was circulated on December 18, 2014. No comments were received.

NEED AND DEMAND

National and State Labor Market Outlook

The Life, Physical, and Social Science Occupations industry, which includes thirty occupational categories, is a generator of jobs in the U.S. economy, according to the Bureau of Labor Statistics. The occupations include 73 percent that require a bachelor's degree or higher and 20 percent that require an Associate's degree.[1] Current labor market reports show that in Bristol County there are 45 different STEM occupations for which trained employees are needed, and 29 percent of these require an Associate's degree, and another 62 percent require a bachelor's degree[2].

The BF/DNA Concentration will address a local workforce shortage as employment at local biotech companies in southeastern Massachusetts has increased significantly. Employment of

[1] *source: http://www.bls.gov/ooh/life-physical-and-social-science/home.htm, retrieved November 10, 2015.*
[2] *source: http://lmi2.detma.org/lmi/Occupation_Projection_jobsSTEM.asp, retrieved November 10, 2015.*

biological technicians is projected to grow 10 percent from 2012 to 2022. Continued growth in biotechnology and medical research is expected to increase demand[3]. Occupational Projections for Massachusetts indicate that biological technicians can expect to see an above average job growth of 16 percent over the next ten years[4]

Student Demand

The Biotechnology program enrollment has increased from 4 to 35 students in the last 4 years. BRCC utilized data from the UMass Donahue Institute, which indicated that as STEM programming increases at the K-12 level, there is a correlated increased interest in STEM-related careers at the post-secondary level. BRCC has also seen an increase in the number of students interested in majoring in Biology at four-year institutions. Students come to BRCC for twp years for a variety of personal and financial reasons and the program provides students with an incentive to complete an associate's degree with BRCC before transferring.

OVERVIEW OF PROPOSED PROGRAM

The proposed program was developed in collaboration with several faculty members in the Natural Sciences Department at BRCC with input and support from the entire department. BRCC also received guidance and advice from Mass Bay Community College, which has a long history of programs in the Life Science field, including a successful Biotechnology program. The College also took into account the needs of students and industry in the region when developing the curriculum.

Duplication

There are several community colleges in the state that offer similar programs to the Biology Concentration. Bunker Hill Community College offers a Biology Transfer Concentration that allows students to transfer to a four-year institution with the goal of majoring in biology. Mass Bay Community College offers an Associate in Science in Life Sciences degree that is similar to the proposed program. Roxbury Community College offers an Associate in Arts in Biological Science degree that prepares students for entry to a four-year institution as a junior. Middlesex Community College offers an Associate in Arts in Liberal Arts and Sciences degree, which allows students to explore the Sciences and Liberal Arts disciplines. The Community College of Rhode Island offers an Associate in Science degree program that prepares students for entry to a four-year institution in several science disciplines such as biology, chemistry, and physics. Berkshire, Bunker Hill, Middlesex, Mt. Wachusett, Northern Essex, Quinsigamond, Roxbury, and Springfield Technical community colleges offer biotechnology degrees that follow the Massachusetts Life Sciences Education Consortium guidelines

[3] *source: http://www.bls.gov/ooh/life-physical-and-social-science/biological-technicians.htm, retrieved November 10, 2015.*
[4] *source: http://lmi2.detma.org/Lmi/Occupation_Projection.asp?Area=01000025long retrieved November 10, 2015.*

ACADEMIC AND RELATED MATTERS

Admission

Candidates will be required to have earned a high school diploma, HiSET or GED equivalency. Math and English placement testing or completion of developmental classes for college level Math and English enrollment may also be required for admission to this program.

PROGRAM ENROLLMENT

	# of Students Year 1	# of Students Year 2	# of Students Year 3	# of Students Year 4*
New Full-Time	20	20	45	75
Continuing Full-Time	0	10	10	25
New Part-Time	20	20	25	25
Continuing Part-Time	0	10	20	25
Totals	**40**	**60**	**100**	**150**

Curriculum (Attachment A)

Internships or Field Studies

All of BRCC biotechnology associate degree students will be required to complete a three-credit- hour Cooperative Work Experience. Cooperative Education at Bristol Community College is a nationally recognized academic internship program which connects students and employers. Since 1986, the Cooperative Education Program has partnered with international, national, regional, and local employers.

Internships are comprised of hands-on training, under the supervision of an experienced company employee. BRCC also offers on-campus internships, working directly with faculty in the BRCC biotech laboratory, for those students with limited access to transportation.
To be eligible for Co-op, students are required to have completed at least 27 credits in their program of study and maintained at least a 2.5 grade point average. All students are pre-screened by the Co-op office prior to being placed with an employer. During the semester, students are required to work a minimum of 150 hours, attend the weekly Cooperative Education Seminar, develop a Learning Agreement, which incorporates input from the student, faculty, and supervisor, and complete all written assignments, including a final paper, reflective journal, and self-evaluations. Employer partners are required to complete a student evaluation for each student employee and a Co-op Program evaluation each semester.

RESOURCES AND BUDGET

Fiscal (Attachment B)

The budget for the program covers instruction, materials and supplies, support staff and program coordination. Sixty-three (63) credits are required to graduate with the AS in Life Sciences, with a three-year average completion rate. Based on the estimated enrollment of 40 students in the first year, tuition and fees costs are: $24 tuition + $155 fees = $179/credit. There is an anticipated increase to 60 students in the second year, and an expected increase to 100 students for the third year. Year four estimates that the program would have an enrollment of 150 students. If the program increases in numbers as estimated, extra sections would require a larger expenditure for faculty and support. This estimate does not take into account any part-time students who may register for the program. The estimated expenses are based on one section per course in the major for the first year and then two sections each in subsequent years based on increased enrollment.

Faculty and Administration (Attachment C)

The current faculty consists of full-time and adjunct professors with appropriate degrees in scientific fields. The programmatic courses are being taught by two adjunct faculty members each teaching approximately 12 credits per semester out of the 32 credits required for the program. Most of the required courses will be taught by full-time faculty who would also teach other sections. Depending upon enrollment, the College may hire additional part-time faculty members to cover some of the courses. BRCC will take into account increases in pay rates for full-time and adjunct faculty, fringe benefit rates, and other increases in supplies over time.

Facilities, Library and Information Technologies

BRCC reports that most of the program infrastructure lab equipment is already in place; therefore, there will be very little need to purchase any new major equipment for the program. The lab supplies are perishable, and BRCC expects that they would need to be purchased just before use as well as would other consumables. An additional $5,000 would need to be added to the existing Science Department budget for lab equipment and supplies to ensure that the lab-based courses have adequately equipped facilities.

BRCC has the lab space and equipment needed for all courses that are outlined in the curricula for both concentrations. A moderate addition of funds will be needed to equip these labs for specialized equipment required for new courses. The College offers all of the basic biology and science courses outlined in the curricula. It is anticipated that course offerings will need to expand to meet the growing student need and to fulfill BRCC's mission to meet the need of the life sciences industry. It is expected that completed construction of the new Health and Science Building will include a number of new labs that include two new microbiology labs, a biochemistry lab, a biotechnology lab, a chemistry lab and a multi-use biology lab. These new labs will be equipped and supplied as required to run all the courses in the proposed degree programs.

It is also anticipated that the existing BRCC library and on-line resources will be more than adequate for the program and several computer labs on campus will meet the technological needs of all students

Affiliations and Partnerships

Several life sciences related employers through which BRCC students have completed internships in the past including Associates of Cape Cod, Inc., East Falmouth, MA, Biogen, Cambridge, MA, Celldex Therapeutics, Fall River, MA, Covidien, Mansfield, MA, Dupuy/Johnson and Johnson, Raynham, MA, Five Start Surgical, New Bedford, MA, MediTech, Fall River, MA, Smith and Nephew, Mansfield, MA and Symmetry Medical, New Bedford, MA. BRCC expects these affiliations and partnerships to be applicable to the proposed program and in addition, BRCC is in the preliminary stages of developing partnerships with MassBiologics, Millstone Medical, and US Labs which are expected to provide further work-based learning opportunities for students.

PROGRAM EFFECTIVENESS

Goal	Measurable Objective	Strategy for Achievement	Timetable
Produce well-qualified candidates for entry level Biotechnology jobs.	Job placement numbers	Prepare students through vigorous coursework and internships.	2 years from start of program, once students begin graduating
Produce well-qualified transfer candidates for 4-year institutions.	Transfer statistics	Prepare students through vigorous coursework.	2 years from start of program, once students begin graduating
Produce well-qualified candidates for entry level Biology Lab Technicians positions in various Biological Sciences.	Job placement numbers	Prepare students through vigorous coursework that includes lab and field work experience and through research based internships.	2 years from start of program, once students begin graduating

Continued on next page.

Demonstrate knowledge of discipline related software and effectively utilize the Internet.	Through courses that would utilize equipment that require software in their operation and certain gene-based website for Bioinformatics related searches for phylogenies related studies and Biostatistics.	Licensing and purchase of Software such as Mathematica Research based courses that results in presentations requiring Internet searches for current genomic information.	The software has been purchased with the equipment and the licensing for *Mathematica,* and it is available for faculty and student use. The curriculum has been designed in a way that would require students to carry out such searches for recent genomic information or determination of relativity.
Demonstrate the ethical standards, values, and attitudes required in Life Sciences.	Student assessments based on their activity, utilization of data, and the use of the correct methods to address any discrepancies in their results and data of their lab based work.	One of the objectives of the lab based work is to enable students to work in groups, act ethically when addressing their results and discussing any oddities in them to ensure they understand the importance of reporting accurate results.	Ethical standards are built in to the program's curriculum and will be included in every course until students graduate. This is a continuing process enforced in every lab-based course students take.

EXTERNAL REVIEW AND INSTITUTIONAL RESPONSE

The proposed program was reviewed by Andrew Grosovsky, Sc.D., Dean of the College of Science and Mathematics at the University of Massachusetts Boston, and Rachel Hirst, Ph.D., Assistant Professor of Biology at Stonehill College in North Easton, MA.

The review team found the proposed program to have a coherent design and to include relevant courses with appropriate standards of depth and breadth. As well, they noted a strong connection and sequence to the core and elective course selection, creating a timely progression for students. The team indicated that the emphasis on inquiry-based learning will be a lasting tool for students' future endeavors. The reviewers found that the institution has provided the faculty and staff with the organizational support and funding necessary for a successful program.

There were a few concerns expressed regarding transferability. One was to reduce the number of electives and add an additional required course; the other was to aggressively seek articulation agreements with baccalaureate programs once approval has been obtained. The team also suggested that a capstone course or experience where students would demonstrate mastery of core requirements for biology majors would strengthen the program.

BRCC responded that it is very engaged in pathways work to ensure transferability of all courses into the baccalaureate major, and it will continue to make this a priority and make revisions as suggested. As well, BRCC determined to bring the capstone suggestion to the program advisory group and to the larger department for further discussion.

STAFF ANALYSIS AND RECOMMENDATION

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

ATTACHMENT A: CURRICULUM

Biology Concentration

Required (Core) Courses in the Major (Total # courses required* = 10*)		
Course Number	Course Title	Credit Hours
BIO 121	Fundamentals of Biological Science I	4
BIO 122	Fundamentals of Biological Science II	4
BIO 230	Seminar in Scientific Lit. and Research Des.	3
CHM 113	Fundamentals of Chemistry I	4
CHM 114	Fundamentals of Chemistry II	4
COM 101	Fundamentals of Public Speaking	3
CSS 101	College Success Seminar	1
ENG 101	Composition 1: College Writing	3
ENG 102	Composition II: Writing about Literature	3
PSY 101	General Psychology	3
	Sub Total Required Credits	**32**
Elective Courses (Total # courses required = 10-11***)***		
Choose 2 of the following Mathematics courses:		
MTH 171	Precalculus-Functions	3
MTH 173	Trigonometry	3
MTH 214	Calculus I	4
Choose 1 of the following History courses:		
HST 111	The West and the World I	3
HST 112	The West and the World II	3
HST 113	United States History to 1877	3
HST 114	United States History from 1877	3
Choose 2 of the following Behavioral/Social Sciences courses:		
GVT 111	US Government	3
GVT 112	Comparative Government	3
SOC 101	Principles of Sociology	3
SOC 212	The Sociology of Social Problems	3
SOC 216	Food, Famine, and Farming in the Global Village	3

SOC 226	Sustainability and Humankind's Future: Life on a Tough New Planet	3
SOC 252	The Sociology of Human Relations	3
SSC 217	Technology and Society	3
Choose 1 of the following Technical Literacy courses:		
CIS 110	Basic Computing Skills	3
CAD 101	Computer Aided Drafting	3
EGR 103	Computer Skills for Engineers and Techs.	3
Choose 1 of the following Multicultural Perspective courses:		
HST 113	United States History to 1877	3
HST 114	United States History from 1877	3
HST 252	African-American History	3
HST 259	History of North American Indian Peoples	3
HST 265	Immigration & Ethnicity in American History	3
ENG 217	Writings from the Margins of Contemporary American Literature	3
ENG 257	Writings from the Margins of Contemporary American Literature	3
ENG 259	Writings from the Margins of Contemporary American Literature	3
HUM 254	Writings from the Margins of Contemporary American Literature	3
Choose 12 Credits of the following Science courses: (choose at least 2 lab courses)		
BIO 126	Introduction to Biotechnology	3
BIO 127	Biotechniques	4
BIO 129	Field Biology	4
BIO 130	The Biology and Behavior of Birds	4
BIO 154	Human Physiology	4
BIO 205	Animal Behavior	4
BIO 220	Introduction to Nutrition	3
BIO 232	Marine Biology	4
BIO 233	Human Anatomy and Physiology I	4
BIO 234	Human Anatomy and Physiology II	4
BIO 235	Ecology	4
BIO 239	Elements of Microbiology	4

BIO 240	Cell Biology	4
BIO 241	Pathophysiology	3
BIO 250	Immunology	4
CHM 225	Biochemistry	4
SCI 115	Science and Care of Plants	4
SCI 119	Coastal Science	4
SCI 240	Introduction to Oceanography	4
OFP 114	Organic Farming Practices I	4
PHY 211	General Physics I	4
PHY 212	General Physics II	4
	Sub Total Elective Credits	***33-34***

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	12
Mathematics and the Natural and Physical Sciences	35-36
Social Sciences	9
Sub Total General Education Credits	56-57
Curriculum Summary	
Total number of courses required for the degree	20-21
Total credit hours required for degree	65-66
Prerequisite, Concentration, or Other Requirements: *This is the Biology Concentration of the Associates in Science in Life Sciences Degree*	

Biotechnology and Forensics DNA Concentration

Required (Core) Courses in the Major (Total # courses required* = 18-19*)		
Course Number	Course Title	Credit Hours
BIO 121	Fundamentals of Biological Science I	4
BIO 126	Introduction to Biotechnology	3
BIO 127	Biotechniques	4
BIO 239	Elements of Microbiology	4
BIO 240	Cell Biology	4
BIO 250	Immunology	4
CED 210	Cooperative Work Experience	3
CHM 115	Health Science Chemistry I	4
CHM 116	Health Science Chemistry II	4
CHM 225	Biochemistry	4
COM 101	Fundamentals of Public Speaking	3
CSS 101	College Success Seminar	1
EGR 103	Computer Skills for Engineers and Techs. (*or waived if student takes 2 online classes*)	0-3
ENG 101	Composition 1: College Writing	3
ENG 102	Composition II: Writing about Literature	3
ENG 215	Technical Writing	3
MTH 119	Fundamental Statistics	3
PSY 101	General Psychology	3
SCI 125	Social and Ethical Issues in Science, Technology, and Health Science	3
	Sub Total Required Credits	**60-63**
Elective Courses (Total # courses required = 2)		
Choose 1 of the following History courses:		
HST 113	United States History to 1877	3
HST 114	United States History from 1877	3
Choose 1 of the following Behavioral/Social Sciences courses:		
SOC 101	Principles of Sociology	3
SOC 257	Social Issues in Loss	3
	Sub Total Elective Credits	***6***

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	12
Mathematics and the Natural and Physical Sciences	38
Social Sciences	6
Sub Total General Education Credits	56
Curriculum Summary	
Total number of courses required for the degree	20-21
Total credit hours required for degree	66-69
Prerequisite, Concentration, or Other Requirements: *This is the Biotechnology and Forensics DNA Concentration of the Associates in Science in Life Sciences Degree*	

ATTACHMENT B: BUDGET

One Time/ Start Up Costs		***Annual Expenses***			
	Cost Categories	**Year 1**	**Year 2**	**Year 3**	**Year 4**
	1-2 Full Time Faculty *(Salary & Fringe)*	$75,000	$150,000	$150,000	$150,000
	5-15 Part Time/Adjunct Faculty *(Salary & Fringe)*	$50,000	$50,000	$100,000	$150,000
	Staff	0	0	0	0
	General Administrative Costs	$2,000	$2,000	$2,000	$2,000
	Instructional Materials, Library Acquisitions	$1,000	$1,000	$1,000	$1,000
	Facilities/Space/Equipment	$5,000	$2,500	$2,500	$2,500
	Field & Clinical Resources	0	0	0	0
	Marketing	$2,500	$2,500	$2,500	$1,500
	Other (Specify)	0	0	0	0
	TOTALS	**$135,500**	**$208,000**	**$258,000**	**$307,000**

One Time/Start-Up Support		***Annual Income***			
	Revenue Sources	**Year 1**	**Year 2**	**Year 3**	**Year 4**
	Grants	0	0	0	0
	Tuition	$20,160	$30,240	$50,400	$75,600
	Fees	$130,200	$195,300	$325,500	$488,250
	Departmental	0	0	0	0
	Reallocated Funds	0	0	0	0
	Other (specify)	0	0	0	0
	TOTALS	**$150,360**	**$225,540**	**$375,900**	**$563,850**

ATTACHMENT C: FACULTY

Name of faculty member (Name, Degree and Field, Title)	Check if Tenured	Courses Taught Put (C) to indicate core course.	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
Amaral, Kimberly MS in Biology/Marine Biology Associate Professor of Biology		BIO-121 (C) BIO-129 BIO-230 (C) BIO-232 BIO-235	Varies	Division V	Full-time	No	All Campuses
Corven, James Ph.D. in Biology Professor of Biology	Tenured	BIO-121 (C) BIO-122 (C) SCI-115 OFP-114	Varies	Division V	Full-time	No	All Campuses
Foster, Adrienne Ph.D. in Structural Biology Professor of Biology	Tenured	BIO-121 (C) BIO-239 (C) BIO-240 (C) BIO-250 (C)	Varies	Division V	Full-time	No	All Campuses
Garcia-Rios, Mario Ph.D. in Biochemistry Associate Professor of Biology and Biochemistry		CHM-113 (C) CHM-114 (C) CHM- 225 (C) BIO-240 (C) BIO-250 (C)	Varies	Division V	Full-time	No	All Campuses
Lefebvre, Katie Ph.D. in Anatomy and Cell Biology Associate Professor of Biology		BIO-126 (C) BIO-127 (C) BIO-233 BIO-234 BIO-239 (C) BIO-240 (C) BIO-250 (C)	Varies	Division V	Full-time	No	All Campuses
Mbugua, Jacqueline MS in Biology Associate Professor of Biology	Tenured	BIO-154 BIO-220 (OL) BIO-233 BIO-234	Varies	Division V	Full-time	No	All Campuses
Rapien, Mary Ph.D. in Biological Oceanography Associate Professor of Biology		BIO-121 (C) BIO-122 (C) BIO-220 (OL) BIO-230 (C) BIO-232 SCI-125 (C)	Varies	Division V	Full-time	No	All Campuses