BOARD OF HIGHER EDUCATION
REQUEST FOR BOARD ACTION

NO.: BHE 23-19

BOARD DATE: December 13, 2022

APPROVAL OF LETTER OF INTENT OF BERKSHIRE COMMUNITY COLLEGE TO AWARD THE ASSOCIATE IN SCIENCE IN NATURAL & PHYSICAL SCIENCES AND AUTHORIZATION FOR FAST TRACK REVIEW

MOVED: The Board of Higher Education (BHE) has evaluated the Letter of Intent of **Berkshire Community College** to award the **Associate in Science in Natural & Physical Sciences** and has determined that the proposal aligns with BHE criteria. Accordingly, the BHE authorizes the Commissioner to review the program and to make a final determination on degree granting authority pursuant to the Fast-Track review protocol.

VOTED: Motion approved and advanced to the full BHE by the Executive Committee on 12/5/2022; and adopted by the BHE on 12/13/2022.

Authority: Massachusetts General Laws Chapter 15A, Section 9(b); AAC 18-40

Contact: Winifred M. Hagan, Ed.D., Senior Associate Commissioner for Strategic Planning and Public Program Approval

BOARD OF HIGHER EDUCATION
December 13, 2022
Berkshire Community College
Letter of Intent
Associate in Arts in Black Studies

DEGREE TITLE ABSTRACT ON INTENT AND MISSION OF PROGRAM

Berkshire Community College (BCC) plans that the newly proposed Natural & Physical Sciences Associate in Science (AS/NPS) degree program aligns well with the mission of the college to place higher education within reach of all residents of Berkshire County and beyond. The intent of the Natural & Physical Sciences Program is to offer students meta-major type pathways in biology, biotechnology, chemistry, and physics. It is expected that the program will provide opportunities for students to explore the sciences while staying aligned in their degree program, saving time and money and increasing overall degree attainment. All pathways focus on the process of scientific inquiry and the fundamentals of how to study the natural world using a systematic approach, that involves observation, testing, analysis, and interpretation. The program also intends to prepare students for Mass Transfer to four-year institutions in the Biology, Chemistry, and Physics BA and BS pathways.

Currently, Biological Science is offered as a concentration within BCC's AS in Liberal Arts degree, which has a diverse array of requirements limiting the number of science and math courses that students can take before exceeding the credit requirements. The NPS degree is intended to provide students with more focused advising and clearer transfer opportunities.

The proposed Associate in Science in Natural & Physical Sciences was approved by the Berkshire Community College Board of Trustees on June 7, 2022. The LOI was circulated on September 14, 2022. No comments were received.

A. ALIGNMENT WITH MASSACHUSETTS GOALS FOR HIGHER EDUCATION

Address Gaps in Opportunity and Achievement in Alignment with Campus-Wide Goals

Consistent with BHE/DHE Equity Agenda goals, the proposed program reflects BCC's commitment to equitable access, retention, completion of programs and successful placement in baccalaureate programs or in careers. The proposed AS/NPS program is intended to offer flexibility and quality to a diverse student population and increase opportunities for people in the region to pursue a career in science. The proposed AS/NPS degree is planned to prepare students to enter or progress within the workforce, for transfer to baccalaureate programs, and to do so while fostering a lifelong enthusiasm for learning. The proposed program is expected to enable students to explore areas of science with pathways in Biology, Biotechnology, Chemistry, and Physics, and provide a breadth of foundational learning opportunities for students that are interested in science and who seek more knowledge to determine a precise focus of study and career.

Program or Department Supports to Ensure Student Retention and Completion

BCC offers a wide range of student support services including STEM Starter Academy which is particularly aligned with the proposed program. Supports in areas of case management, mentoring, scholarships, research opportunities, internships, and coaching will be available to all students enrolled in the proposed program. It is planned that BCC's tutoring center will assist students using evidence-based high impact practices such as differentiated collaboration in groups and applied learning experiences, close and directed engagement with professors, individualized approaches to learning and skill demonstrations, learning communities, field trips, and experiential learning. BCC also hosts a successful 'Talent, Resources, Initiative, Opportunity' (TRIO) program for first-generation, low-income, and differently abled students. Additionally, BCC reports that it is establishing a Science Commons on campus, which will offer a wide range of technical equipment to perform hands-on projects related to the proposed program (and others).

Alliances and Partnerships with PK-12, Other IHE's, Community Employers

BCC reports that the faculty have establish relationships and partnered with local PK-12 education systems for many years through various connections. These include faculty outreach with presentations and programs, including providing neighboring Lee High School with on-campus instruction as a regular part of its Advanced Placement Biology course. The high school students come to BCC's laboratory classrooms four times each year to experience college level instruction and exposure to advanced laboratory equipment and techniques. The BCC campus also provides free training in the area of water quality monitoring and assessment to area environmental organizations such as the Berkshire Environmental Action Team, Housatonic Valley Association, and Hoosic River Watershed Association. BCC reports that these organizations then use their new skills in support of projects sponsored by Massachusetts Department of Environmental Protection and by the U.S. Environmental Protection Agency in areas of municipal MS4 permitting, illicit discharge monitoring, stream crossing surveying. In addition to providing training to local environmental groups, the college offers training and chemical and bacteriological lab testing services free of charge to those groups that are involved in agency-sponsored projects or in citizen science. BCC is organizing an advisory group and included a list of stakeholders in the Letter of Intent (LOI). It is expected that the advisory will be finalized after the LOI is approved by the Board of Higher Education.

Relationship to MassHire Regional Blueprints

BCC finds that Massachusetts remains a hub for the life science industry, reporting that even during a pandemic-induced recession, life sciences employment increased by 4% in 2020, doubling the national rate. BCC cited the 2021 MA Life Sciences Employment Outlook Report which indicates that between 2021 through 2024, if recent industry growth trends continue, the life science industry is expected to generate over 20,000 net new jobs across occupations from STEM fields to sales, production, management, and business functions.[1]

In addition to the need for Life and Physical Science employees in Massachusetts, BCC noted a need for STEM teachers in MA and across county and provided a detailed rubric of STEM teacher shortage rates in the body of the LOI. It is expected that by combining BCC STEM programs with education offerings and with MassTeach opportunities, BCC will contribute to teacher preparation toward transfer to baccalaureate programs. In addition, BCC found that the U.S. science, technology, engineering, and mathematics (STEM) labor force represents 23% of the total U.S. labor force, involves workers at all educational levels, and includes higher proportions of men, Whites, Asians, and foreign-born workers than the proportions of these groups in the U.S. population. As well BCC noted that disparities in K–12 STEM education and student performance across demographic and socioeconomic categories and geographic regions are challenges to the U.S. STEM education system.[2]

Duplication

By providing pathways for biology, biotechnology, chemistry, and physics, it is expected that the proposed AS/NPS program will be the only Associate in Science degree of its kind offered within a 50-mile radius.

Innovative Approaches to Teaching and Learning

BCC plans that the proposed AS/NPS will include several digital and experimental approaches that actively support student learning as follows:

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[1] *TEConomy Partners, LLC. (2021, June). Massachusetts Life Sciences Employment Outlook Report. Retrieved April/2022* *https://massbioed.app.neoncrm.com/np/clients/massbioed/product.jsp?product=29&*

[2] *Amy Burke, Abigail Okrent, and Katherine Hale. (2022, January). The State of U.S. Science and Engineering 2022. (Executive Summary Retrieved April /2022* *https://ncses.nsf.gov/pubs/nsb20221/executive-summary*

Research Based Experiences: BCC plans that the proposed program will encourage the continued use of research-based inquiry, especially in the laboratory, using critical thinking and utilizing the scientific method. It is expected that students will have multiple opportunities to conduct undergraduate research within the proposed program courses. In addition to researched based experiences, BCC plans that students will do independent study experiments as extensions of content learned in other classes. They will also be able to add independent study credit to a course, and complete semester long, faculty-guided experiments for credit. Student opportunity to team up with a faculty member to complete projects that will enrich their scientific journey though non-credit bearing is anticipated to be a way to strengthen student knowledge and experience. This is aligned with the *BCC Undergraduate Scholars Conference* and with the UMASS Undergraduate Research Conference and the Northeast Regional Honors Conference, all of which regularly celebrate student work of exceptional merit leading to acceptance in well-respected baccalaureate programs. It is expected that the new pathways in the proposed program will lead to new opportunities for students.

Berkshire Science Commons: BCC plans that all four pathways will engage in the newly formed Berkshire Science Commons. The Science Commons is a combination of technology space, discovery lab, natural history museum, and public science hub. The space is equipped with equipment for natural and physical science learning and research opportunities. In addition, students will participate in community outreach in the form of citizen science research hubs in areas such as water quality testing, microbiology projects, DNA fingerprinting as well as assistive technology training. It is expected that students and faculty or technicians will perform experiments or engineering projects. One example of this BCC provided is that students engineered a device enabling the water quality testing instruments to capture and test secondary run-off from outfalls (instead of contaminated primary run-off).

Simulations: *The Anatomage Table* is a simulation tool that enables the virtual dissection and analysis of a life-size 3D human and other animal models. *Simulation Websites* are utilized in lecture and lab to improve conceptual learning and provide constraints on students that allow them to focus on logical outcomes. It also provides the ability of students to explore multiple other technologies on-line. SimBio is used by biology lab students in the discovery of evolution and speciation, and biology, biotechnology and chemistry courses utilize 'Phet' Simulations [3]to improve inorganic and organic chemistry visualization. *Core-Competencies* shaped the biotechnology program. It is anticipated that BCC will continue to enhance hands-on experiences in other lab sciences courses.

The *Learning Management System* (Moodle) serves to increase interaction and communication between faculty and students. It also provides ease of document management, assessment opportunities, discussion forums and transparency in grading. BCC also expects that Moodle will provide a platform for faculty to create more equitable experiences for students by providing alternative forms of learning opportunities. Providing such support materials increases is expected to increase student success in meeting the proposed program outcomes.

B. ALIGNMENT WITH CAMPUS STRATEGIC PLAN AND MISSION

Priority Rationale and Support of Strategic Plan and Overall, Mission of Institution

Two significant goals of the BCC strategic plan are directly tethered to the development of the proposed program. BCC's strategic plan for engaged learning includes the Strategic Goal *To promote a dynamic, diverse environment that prepares students for the 21st century, encourages innovation, incorporates leading technology, and utilizes best practices to promote academic excellence.* A key strategy for reaching this goal is to clarify pathways that help students reach their educational and career goals. The

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[3] *PhET simulations are interactive simulations of science and math concepts created by the University of Colorado Boulder. Students are able to run these simulations, manipulating different aspects of a construct to understand science and mathematics concepts. Depending on the simulation, students may also be able to collect, graph, and analyze data to draw conclusions of their own.* Retrieved 10/31/22 [PhET Simulations | Online Tools for Teaching & Learning (umass.edu)]

strategic outcome tethered to this goal is for BCC to have a transformed curricular framework that increases access, advances innovation, promotes degree completion, and effects data-driven change. BCC's DEI mission is committed to educating students, and the community as a key to contributing a more equitable, diverse, and inclusive society. BCC reports that it is committed to the continued learning and action that will lead this outcome. BCC expects that the proposed AS/NPS will provide an accessible, equity-minded STEM education for students in the Berkshires within a supportive and academically rigorous environment. BCC further reports that the proposed AS/NPS program is a priority at BCC because students have been asking for it. The students want more courses to explore the different areas of science, more research opportunities, more exposure to faculty and students doing actual science instead of reading scientific theory and learning about other people who are doing the actual science. The proposed program is expected to provide this learning opportunity. Students will be able to earn more credit hours in specific pathways that have application to similar pathways, such that a change in pathways will not cost students time or money, opening a door to exploration in the early stages of learning.

The proposed AS/NPS is designed to provide a foundation in the natural and physical sciences and mathematics, while equipping students with interdisciplinary skills to explore the scientific questions and issues of the natural world. The pathways in the proposed AS/NPS degree program will fully support the engaged learning components of the strategic plan in ways described in the priority statement above. By creating clear pathways in biology, biotechnology, chemistry and physics students are offered opportunities that have not existed at BCC. The AS/NPS program meets all MassTransfer requirements and will provide students with the necessary skills and background to be successful at the receiving institution. The proposed program is aligned with BCC's strategic plan for student engagement through one of its Strategic Goals, a Key Strategy and a planned Strategic Outcome. The Strategic Goal is to construct an integrated enrollment and student support system that increases access, fosters student development, leads to increased retention and persistence, shortens time-to-credential, and improves graduation rates. The Key Strategy is to: establish a first-year experience program that incorporates academic success strategies, educational and career planning, and diversity awareness; develop a proactive advising and mentoring system with dynamic monitoring, academic alerts, and timely interventions leading to improved retention; and review graduation requirements to promote student success and degree completion. The Strategic Outcome is that BCC will have developed a systemic approach to enrollment management, improved persistence and retention, and increased degree completion.

BCC's decision to move biology and biotechnology out of liberal arts is based on providing students with more options, and to increase enrollment by bundling pathway possibilities including chemistry and physics. Increasing the number of prospective graduates in the proposed program is expected to mitigate closure of any one pathway during this challenging enrollment period. In addition, students identifying as science majors will be strongly encouraged to participate in the STEM Starters program. BCC also plans that students will benefit from direct advising by faculty that are knowledgeable about their specific pathway. They can offer clear course selection recommendations, exposure to workforce opportunities, recommendations on internships and research opportunities and deepen the student faculty relationship that lead to retention and graduation.

LOI Program Goals and Objectives (Form B)

BCC reports that the proposed NPS goal and objectives are rooted in accessibility, flexibility and removing barriers for students. The overarching goal is to create a meta major that allows students to explore the sciences without stumbling over hidden credits and unforeseen challenges as they potentially move from one science to another. This type of flexibility minimizes time and financial loss while maximizing exposure to the sciences. The objectives will be measured and strategies for achievement will be evaluated on a yearly basis.

C. ALIGNMENT WITH OPERATIONAL AND FINANCIAL OBJECTIVES OF INSTITUTION

Enrollment Projections (Form C)

The projections detailed were extracted from the BCC 2021 Data Book generated by the college's Institutional Effectiveness Team. The projections are based on the past five years of the biology program enrollment averaging 40-day students and 28 evening students.

Once the NPS program is approved by the Department of Higher Education, BCC plans that the Liberal Arts AA Biology concentration will no longer be available to new students. Those already matriculated into the Liberal Arts AA Biology concentration will be able to complete their degree under the new program or complete their original concentration. The change to an AS degree is designed to include six credits of humanities and fine arts. The AS/NPS students can take a large variety of advanced writing courses, history courses and fine arts classes.

Once the NPS program is established, faculty foresee an increase in students wanting to study science education and pre-health programs. This will allow for more collaboration with the education department and the health science faculty. The opportunity for more pathways will be evaluated as the program grows.

Resources and Financial Statement of Estimated Net Impact on Institution (Form D, Appendices)

BCC does not expect one-time or start-up costs for full-time faculty, adjunct faculty, staff, general administrative purposes, facilities, or space. The infrastructure and personnel necessary to run the program are already in place. Full-time faculty and adjunct faculty are qualified to teach all necessary program courses. Existing labs are well equipped. Instructional materials, consumables, field work, research assignments, and experiential learning will generate yearly costs as listed. Significant other costs are not anticipated.

STAFF REVIEW AND VALIDATION

Staff thoroughly reviewed the **LOI** proposing full degree granting authority for the **Associate in Science in Natural & Physical Sciences** submitted by **Berkshire Community College.** Staff validate that the **LOI** includes all data required by the Massachusetts Board of Higher Education. Staff recommendation is for BHE authorization for the Commissioner to review the program pursuant to the Fast-Track review protocol.

Curriculum Outline I: *Chemistry Pathway*

Required (Core) Courses in the Major (Total # courses required = 2)		
Course Number	Course Title	Credit Hours
CHM 101	Introductory Chemistry I	4
CHM 102	Introductory Chemistry II	4
	Sub Total Required Credits	8
Elective Courses (Total # courses required = 9) *(attach list of choices if needed)*		
MAT electives	See attached options	4
BIO/ENV/CHM/ENT/MAT electives*	See attached options	30
	Sub Total Elective Credits	34
Distribution of General Education Requirements Attach List of General Education Offerings (Course Numbers, Titles, and Credits)		# of Gen Ed Credits
English Composition / Writing		6
Behavioral and Social Sciences		6
Humanities and Fine Arts		6
	Sub Total General Education Credits	18
Curriculum Summary		
Total number of courses required for the degree	19	
Total credit hours required for degree	60	

* BIO/ENV/CHM/ENT/MAT electives* should be chosen from the following courses:
BIO 101, 102, 132, 230, 109, 110, 207, 236
ENV 208, 139
CHM 201, 202
ENT 161, 261, 185, 203, 212, 233, 235
MAT 123, 151, 152, 251, 254, 218, 253, 218

Footnotes:

1. Chemistry Elective: Chemistry elective should be chosen from the following: MAT-254, Differential Equations; MAT-218, Probability and Statistics; or BIO-132, Biological Lab Techniques

2. Biology and Biotechnology Electives: Science electives must be chosen from the following: BIO-109, Ecology I; BIO-110, Ecology II; BIO-207, Microbiology; BIO-230, Biotechnology, BIO-236, Evolution; ENV-208, Aquatic Biology; ENV-139, Tropical Ecosystems; ENT-161, Physics I; ENT-261, Physics II.
Math elective should be from MAT-121, Precalculus or MAT-151, Calculus I; or MAT-152, Calculus II

3. English Composition: Students are strongly encouraged to select ENG-116, Technical Writing, as their second English Composition/Writing course.

4. Physics Electives: Physics electives should be chosen from the following: MAT-253, Linear Algebra; MAT-218, Probability and Statistics; ENT-185, Engineering Computer Applications; ENT-203, Linear Circuits; ENT-212, Statics; ENT-233, Digital Circuits; ENT-235, Microprocessors and Digital Circuits

Curriculum Outline II: Chemistry Pathway

Major Required (Core) Courses (Total # of courses required = 2)		
Course Number	Course Title	Credit Hours
CHM 101	Introductory Chemistry I	4
CHM 102	Introductory Chemistry II	4
	Sub-total # Core Credits Required	8
Elective Course Choices (Total courses required = 15) *(attach list of choices if needed)*		
BIO 101	General Biology I	4
ENG 101	Composition I	3
MAT 151	Calculus I	4
ENT 161	Physics I: Mechanics	4
MAT 152	Calculus II	4
ENG 116	Technical Writing	3
CHM 201	Organic Chemistry I	4
ENT 162	Engineering Physics II	4
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
ELECTIVE	See footnote 1	3
CHM 202	Organic Chemistry II	4
ELECTIVE	See footnote 1	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
	Sub-total # Elective Credits Required	52

Curriculum Summary	
Total number of courses required for the degree	17
Total credit hours required for degree	60
Prerequisite, Concentration or Other Requirements: Chemistry Pathway	

Footnote:

1. Chemistry Elective: Chemistry elective should be chosen from the following: MAT-254, Differential Equations; MAT-218, Probability and Statistics; or BIO-132, Biological Lab Techniques

Curriculum Outline III: ***Physics Pathway***

Major Required (Core) Courses (Total # of courses required = 2)		
Course Number	Course Title	Credit Hours
CHM 101	Introductory Chemistry I	4
CHM 102	Introductory Chemistry II	4
	Sub-total # Core Credits Required	8
Elective Course Choices (Total courses required = 15) *(attach list of choices if needed)*		
MAT 151	Calculus I	4
ENG 101	Composition I	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
ENT 161	Physics I: Mechanics	4
MAT 152	Calculus II	4
ENG 116	Technical Writing	3
MAT 251	Calculus III	4
ENT 162	Engineering Physics II	4
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
ELECTIVE	See footnote 4	4
MAT 254	Differential Equations	3
ELECTIVE	See footnote 4	4
ELECTIVE	See footnote 4	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
	Sub-total # Elective Credits Required	52

Curriculum Summary	
Total number of courses required for the degree	17
Total credit hours required for degree	60
Prerequisite, Concentration or Other Requirements: Physics Pathway	

4. Physics Electives: Physics electives should be chosen from the following: MAT-253, Linear Algebra; MAT-218, Probability and Statistics; ENT-185, Engineering Computer Applications; ENT-203, Linear Circuits; ENT-212, Statics; ENT-233, Digital Circuits; ENT-235, Microprocessors and Digital Circuits

Curriculum Outline IV*: Biology Pathway*

Major Required (Core) Courses (Total # of courses required = 2)		
Course Number	Course Title	Credit Hours
CHM 101	Introductory Chemistry I	4
CHM 102	Introductory Chemistry II	4
	Sub-total # Core Credits Required	8
Elective Course Choices (Total courses required = 15) *(attach list of choices if needed)*		
BIO 101	General Biology I	4
ENG 101	Composition I	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
BIO 102	General Biology II	4
ENG 116	Technical Writing	3
MAT 121	Precalculus	4
BIO 132	Biological Lab Techniques	3
CHM 201	Organic Chemistry I	4
MAT 123	Elementary Statistics	3
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
ELECTIVE	See Footnote 2	4
CHM 202	Organic Chemistry II	4
ELECTIVE	See Footnote 2	4
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
	Sub-total # Elective Credits Required	52

Curriculum Summary	
Total number of courses required for the degree	17
Total credit hours required for degree	60
Prerequisite, Concentration or Other Requirements: Biology Pathway	

2. Biology and Biotechnology Electives: Science electives must be chosen from the following: BIO-109, Ecology I; BIO-110, Ecology II; BIO-207, Microbiology; BIO-230, Biotechnology, BIO-236, Evolution; ENV-208, Aquatic Biology; ENV-139, Tropical Ecosystems; ENT-161, Physics I; ENT-261, Physics II.

Curriculum Outline V*: Biotechnology Pathway*

Major Required (Core) Courses (Total # of courses required = 2)		
Course Number	Course Title	Credit Hours
CHM 101	Introductory Chemistry I	4
CHM 102	Introductory Chemistry II	4
	Sub-total # Core Credits Required	8
Elective Course Choices (Total courses required = 15) *(attach list of choices if needed)*		
BIO 101	General Biology I	4
ENG 101	Composition I	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
BIO 102	General Biology II	4
ENG 116	Technical Writing	3
MAT 121	Precalculus	4
BIO 132	Biological Lab Techniques	3
CHM 201	Organic Chemistry I	4
ELECTIVE	See Footnote 2	4
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
HUMANITIES/ FINE ARTS	Choose from any course designed as meeting BCC's general education requirements in humanities and fine arts, coded HU.	3
BIO 230	Introduction to Biotechnology	4
CHM 202	Organic Chemistry II	4
ELECTIVE	See Footnote 2	3
BEHAVIORAL/ SOCIAL SCIENCE	Choose from any course designed as meeting BCC's general education requirements in behavioral or social sciences, coded SS.	3
	Sub-total # Elective Credits Required	52

Curriculum Summary	
Total number of courses required for the degree	17
Total credit hours required for degree	60

Prerequisite, Concentration or Other Requirements: Biotechnology Pathway

2. Biology and Biotechnology Electives: Science electives must be chosen from the following: BIO-109, Ecology I; BIO-110, Ecology II; BIO-207, Microbiology; BIO-230, Biotechnology, BIO-236, Evolution; ENV-208, Aquatic Biology; ENV-139, Tropical Ecosystems; ENT-161, Physics I; ENT-261, Physics II.

Form B: LOI Goals and Objectives

Goal	Measurable Objective	Strategy for Achievement	Timetable
To create AS degree pathways in biology, biotechnology, chemistry, and physics that allows for student exploration in the sciences	Matriculated students moving between pathways, determining what area of science is most aligned with their vision for their future.	Providing clear pathways for students to explore. A variety of electives that give students introductory exploration into the sciences and the potential career possibilities	Ongoing advising and continued cycling of electives will give students the robust experience they have been asking for
The four pathways prepare students for seamless transfer with junior standing to four-year institutions, especially the UMASS system schools	Students fulfill all requirements outlined in their respective program pathway	The creation of four different pathways within the NPS program that meets all Mass Transfer requirements. More directed advising from faculty that are knowledgeable about their specific pathway. The Office of Institutional Effectiveness, student transfer will be tracked over time	Initially, careful advising of students that decide to matriculate into NPS from other programs to ensure a seamless transfer. Once the program is running, this should be consistent as advising will be pathway specific with continued communication with students and pathway advisors Students will be surveyed after their first year at the transferring institution.
Diversify cohorts of young and rising scientific by the inclusion of underrepresented minorities	Enrolled students and program graduates include a mixture of diverse ethnic, socioeconomic, and gender identifying groups	Collaboration with DEI, TRIO, and other campus organizations to recruit diverse cohorts of students and ensure the NPS program as a whole is inclusive	Yearly review of enrollment demographics and corrective actions taken as needed
To provide students with a strong foundation in the natural and physical sciences and mathematics, while equipping students with interdisciplinary skills.	Graduation requirements include two chemistry courses, one math course, at least one biology, environmental, or engineering course, and at least one English, behavioral and social sciences, and humanities and fine arts course.	Consistent meetings with pathway specific advisors to ensure students are on path to graduate. Program group advising meeting at the beginning of each semester.	Ongoing

Apply the scientific method and understand the relationships among observation, experimentation, evidence, conclusions, and theory in the natural and physical sciences.	Laboratory questions building on continued exposure to use of the scientific method, including formal laboratory reports.	Biology and chemistry lab courses involve experimentation where students will apply the scientific method. Laboratory exposure to the scientific method; initially instructor guided and eventually expectations of students designing and executing experimentation, data collection and analysis.	Continuation courses expectation includes instructor guided experimentation in first course and student directed experimentation in second course.
Collect data and create graphs or other visual representations in a clear and logical fashion that may include statistics.	Course learning outcomes in CHM 101, MAT electives, BIO electives, CHM electives, and ENT electives. Lecture content and labs will enable students to achieve these learning outcomes.	Completion of program pathway course recommendations	Ongoing

Form C: LOI Program Enrollment

	Year 1	Year 2	Year 3	Year 4	Year 5
New Full-Time	40	40	45	45	45
Continuing Full-Time		40	45	45	45
New Part-Time	20	20	25	25	25
Continuing Part-Time		20	25	25	25
Totals	60	60	70	70	70

Form D: LOI Budget

One Time/ Start Up Costs							
		Annual Enrollment					
	Cost Categories	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**
Current full-time faculty members will teach program courses. No start-up costs.	Full Time Faculty *(Salary & Fringe)*					
Current adjunct faculty members will teach evening and summer program courses. No start-up costs.	Part Time/Adjunct Faculty *(Salary & Fringe)*					
Current assistants will support program labs. No start-up costs.	Staff					
No accreditation, credentialing, or similar administrative costs. No start-up costs.	General Administrative Costs					
Lab equipment shared with Science Commons. Some additional instructional materials will have to be purchased.	Instructional Materials, Library Acquisitions	7,000	7,000	7,000		
Science Commons, biology, biotechnology, chemistry, and physics labs available and fully equipped. No start-up costs.	Facilities/Space/Equipment					
Field work, research assignments, and experiential learning will be conducted in collaboration with the Science Commons. Some additional materials will have to be purchased.	Field & Clinical Resources	3,000	3,000	3,000		
	Marketing	2,000	2,000	2,000		
None.	Other (Specify)					
One Time/Start-Up Support		***Annual Income***				
	Revenue Sources	**Year 1**	**Year 2**	**Year 3**	**Year 4**	**Year 5**

	Grants					
	Tuition (= $26/ credit, the program requires 15 credits/ semester/ student = 30 credits/ year/ student)	31,200 (full-time students) 7,280 (part-time students, assuming a semester average of 14 credits/ student)	62,400 (full-time students) 14,560 (part-time students)	70,200 (full-time students) 18,200 (part-time students)	70,200 (full-time students) 18,200 (part-time students)	70,200 (full-time students) 18,200 (part-time students)
	Fees (= $197/ credit, the program requires 15 credits/ semester/ student = 30 credits/ year/ student)	236,400 (full-time students) 55,160 (part-time students)	472,800 (full-time students) 110,320 (part-time students)	531,900 (full-time students) 137,900 (part-time students)	531,900 (full-time students) 137,900 (part-time students)	531,900 (full-time students) 137,900 (part-time students)
	Departmental	7,000	7,000	7,000	7,000	7,000
	Reallocated Funds					
	Other (specify)					
	TOTALS	337,040	667,080	765,200	765,200	765,200