Metropolitan Community College Biotechnology Program Proposal
Proposal for New Instructional Program
Approved by Metropolitan Community College Board on 7/23/24

METROPOLITAN COMMUNITY COLLEGE
NEW INSTRUCTIONAL PROGRAM PROPOSAL

I. DESCRIPTIVE INFORMATION

- Institution Name: Metropolitan Community College (MCC)
- Proposed Program Name: Biotechnology Program
- Degrees/credentials to be awarded to graduates of the program:
  - Career Certificate
  - Certificate of Achievement
  - Associate of Science – Biotechnology Degree (AS)
- Other programs offered in this field by this institution: None
- CIP Code: 26.1201
- Administrative units for the program: Mathematics and Natural Science
- Proposed delivery sites/types of delivery: MCC - Elkhorn Campus/Face-to-face; Hybrid
- Proposed date (term/year) the program will be initiated: Fall 2026

Description and purpose of the proposed program:

Biotechnology is the use of biological systems or living organisms to produce products for human and animal health, agriculture, the environment, and specialty biochemical manufacturing. Pending Commission approval, MCC's Biotechnology program will prepare students to be employed as entry-level technicians in local biotechnology industries including biomanufacturing, biopharma, and biofuels companies by providing students with core science knowledge and industry-reflective laboratory skills.

In this program, students will gain knowledge and skills in a state-of-the-art lab reflecting a typical biomanufacturing industry setting. Students will have hands-on work-based experiences in biotechnology concepts and lab techniques such as:

- Industrial Safety Protocols
- Aseptic Technique
- Basic Science Laboratory Techniques
- SOPs (Standard Operating Procedures)
- GDP (Good Documentation Practices)
- PPE (Personal Protective Equipment)
- Clean vs. Dirty (Contamination Avoidance)
- Fermentation processes
- Bioreactor/Fermenter Training

- Cell Culturing Methods
- DNA/RNA/Proteins
- Large Molecule Biologics
- Quality Assurance/Quality Control/Data Analysis
- Regulatory Agencies
- cGMP (current Good Manufacturing Practices)
- Problem Solving/Troubleshooting

Project Summary:

MCC is developing a biotechnology training program that will prepare students for entry-level technician jobs at local biotech companies. We plan to create a stackable program that includes a Career Certificate, Certificate of Achievement, and transferable Associate Degree that also includes work-based experiences (internships) with our industry partners. We also plan to increase awareness of the industry by organizing summer camps for middle and high school students and creating a high school Biotechnology Career Academy. The college will also develop workforce/non-credit/micro-credential opportunities that tie in with the credit program and serve to recruit students from the diverse population in and around Omaha.

Project Need:

Based on industry input and local economic data there is a need for entry-level technicians that have basic biotechnology skills, particularly in biomanufacturing and fermentation processes. We are working with industry partners to address this problem by developing a training program that will enable students to be "biotech ready" and qualified for employment as technicians in the industry. No college in the Omaha area has such a biotechnology technician training program and there is only one other college with a biotechnology degree program in the state – Southeast Community College (SCC) in Lincoln. We have visited SCC and other college programs throughout the country to learn about the type of training facilities, equipment, and curriculum that will best train students for the industries in the Omaha area.

Project Objectives:

1) Create a stackable certificate/degree program that addresses local industry needs for trained technicians. This will involve creating six new course offerings geared towards providing biotechnology and biomanufacturing curriculum reflective of local industry.
2) Design and implement a professional development curriculum for both college and high school instructors that will provide training in biotechnology concepts and hands-on lab activities.
3) Develop and implement a biotechnology awareness campaign for internal and external stakeholders including secondary students, college students, parents, community members, and local and state-wide organizations.
4) Design and build an industry-reflective biotechnology training laboratory to support credit, non-credit, and outreach offerings.

Program Learning Outcomes:

- Describe the application of molecular and cell science to the production of biologically important or industrially useful products.
- Perform basic laboratory methods common to biotechnology such as documentation (GDP), SOPs, pipetting, dilutions, centrifugation, hematology tests, bacterial transformation, Polymerase Chain Reaction (PCR), gel electrophoresis, and cell culture methods.
- Define and explain the basic principles, concepts, and techniques of biotechnology.

Program Requirements:

Biotechnology Degree
Awards: Career Certificate, Certificate of Achievement,
Associate of Science Degree - Biotechnology
Program Location: MCC Elkhorn Valley Campus

Graduation Requirements:

Career Certificate: Biotechnology - 27.5 credit hours – Begins in 26/27 Catalog

Career Certificate	Credit Hours
BIOS 1111 Biology I	5.0
BIOS 1610 Fundamentals of Biotechnology	6.0
BIOS 2610 Intro to Biomanufacturing	6.0
BIOS 2620 Quality Assurance	4.5
BIOS 2150 Microbiology	6.0
Total Hours for Career Certificate	**27.5**

Graduation Requirements:

Certificate of Achievement: Biotechnology – 53.5 credit hours - Begins in 26/27 Catalog

Certificate of Achievement - Biotechnology	Credit Hours
Major Requirements: 39.5	
BIOS 1111 Biology I	5.0
BIOS 2150 Microbiology	6.0
BIOS 1610 Fundamentals of Biotechnology	6.0
BIOS 2610 Introduction to Biomanufacturing	6.0
BIOS 2620 Quality Assurance	4.5
BIOS 2660 Hematology or BIOS 2050 Genetics or BIOS 2800 Internship	4.5
CHEM 1212 General Chemistry I	7.5
General Education: 14	
ENGL 1010 English Composition I	4.5
MATH 1425 Pre-Calculus Algebra	5.0
HMRL 1010 Human Relations Skills	4.5
Total Hours for the Certificate of Achievement	**53.5**

Biotechnology – Transfer AS Degree (BIOT) – Begin in 26/27 Catalog

Location(s): Elkhorn Valley Campus

Award: Associate in Science Degree

Academic Focus Area: Transfer: This degree provides students with the dual option of seeking entry-level biotechnology positions and/or continuing their studies at a four-year institution.

Graduation Requirements
To earn this degree, a student must complete all required courses.

Total credit hours required: 94.0 credit hours

Major Requirements: 55.5 – 56.0 credit hours

- **BIOS 1111 – Biology I** **5.0 Credits**
- **BIOS 1121 – Biology II** **5.0 Credits**
- **BIOS 1610 – Fundamentals of Biotechnology** **6.0 Credits**
- **BIOS 2610 – Introduction to Biomanufacturing** **6.0 Credits**
- **BIOS 2620 – Quality Assurance** **4.5 Credits**
- **BIOS 2640 – Nucleic Acids** **5.0 Credits**
- **CHEM 1212 – General Chemistry I** **7.5 Credits**
- **CHEM 1220 – General Chemistry II** **7.5 Credits**
- ***MATH 1425 – Pre-calculus Algebra** **5.0 Credits**
  OR MATH 1410 – Statistics **4.5 Credits**

Elective:

- **BIOS 2660 Hematology or BIOS 2050 Genetics or BIOS 2800 Internship 4.5 Credits**

**Note: If MATH 1425 is selected for the Quantitative/Numeracy general education course then select MATH 1410. If MATH 1410 is selected for the Quantitative/Numeracy general education course then select MATH 1425.*

General Education requirements: (38.0 - 38.5 credit hours minimum)
The following are General Education requirements for an Associate in Science degree (AS).
Students may not use the same course to satisfy more than one degree requirement.

Communication
3 Courses needed 13.5 credit hours

- ENGL 1010 - English Composition I 4.5 Credits
- COMS 1110 - Public Speaking 4.5 Credits
- ENGL 1020 - English Composition II 4.5 Credits

Quantitative/Numeracy
1 Course needed 4.5 - 5.0 credit hours

- **MATH 1425 - Pre-Calculus Algebra or higher**

OR

- **MATH 1410 - Statistics or higher**

**Based on the Math Course you select, pre-requisites may be required.*

Critical Thinking/Creativity & Social/Cultural Awareness
1 course needed 4.5 credit hours
Select 1 Humanities or 1 Social Sciences course from the Transfer Course options in the current course catalog.

- **Humanities Transfer Course options**

OR

- **Social Sciences Transfer Course options**

Scientific Inquiry
2 Courses needed 11 credit hours (9.0 credit hours minimum)

- **BIOS 2150 – Microbiology 6.0**
- **BIOS 1130 – Biology III 5.0**

Professionalism/Life Skills & Information Literacy
1 Course 4.5 credit hours

- **HMRL 1010 - Human Relations Skills**

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Course Descriptions:

BIOS 1610 Fundamentals of Biotechnology - 6.0 credit hours
Students are introduced to the biotechnology industry, learn safety protocols and basic aseptic technique, learn and use various laboratory tools and measurements, demonstrate good pipetting, make solutions, demonstrate good documentation practices, use standard operating procedures, and demonstrate how and when appropriate PPE is used in an industrial bioscience setting.

BIOS 2600 Intro to Biomanufacturing - 6.0 credit hours
This course introduces students to fermentation processes including cell culture techniques. Students will use bacteria, yeast, algal, and mammalian cells to produce proteins using the tools of manufacturing including upstream and downstream procedures, bioreactor operation, separation methods, and production methods. Students will also learn and gain experience in the process of scaling up used in biomanufacturing.

BIOS 2620 Quality Assurance - 4.5 credit hours
Students learn about regulatory agencies and the different levels of regulations involved both in the U.S. and internationally for companies in the biotechnology sector. Students will learn all aspects of Quality Assurance and how to conduct quality control procedures on techniques learned in prior biotechnology classes. Topics covered include GXP, ISO9000, and Lean and Six Sigma as they apply to the biotechnology, biopharmaceutical, bioscience, and biomedical device industries.

BIOS 2640 Nucleic Acids - 6.0 credit hours
Students learn techniques such as deoxyribonucleic acid (DNA) extraction, DNA purification, polymerase chain reaction (PCR), gel electrophoresis, DNA quantitation, plasmid construction and topics involving DNA use in modern biotechnology research settings. Students will also learn techniques involving the expression and analysis of proteins, protein separations, and assays.

BIOS 2660 Hematology - 4.5 credit hours
Students learn basic concepts of hematology such as overall blood composition and the morphology and function of red blood cells, white blood cells, and platelets. Students learn to identify various formed elements using microscopy, perform routine hematology tests, standard calculations and analysis, and explore the clinical significance of abnormal values. Students acquire good laboratory practices, basic measurement methods, and communication skills important in a laboratory setting and visit a clinical laboratory.

BIOS 2670 Instrumentation - 4.5 credit hours
Students gain knowledge of the functions, operation, and maintenance of common biotechnology laboratory equipment, including medical devices. Students learn the importance of good documentation practices and standard operating procedures in complying with requirements of regulatory agencies. Students can observe local laboratory environments and explore emerging trends in biotechnology.

BIOS 2800 Biotechnology Internship (150 hours) – 1.0 - 4.5 credit hours
The internship experience provides students with a fully immersive experience on site at a local biotechnology company. Students develop an individual career plan, demonstrate competency working in a biotechnology role, create a resume, demonstrate employability skills, maintain a work notebook, submit regular evaluations, and write a final report summarizing the internship experience.

II. REVIEW CRITERIA

A. Centrality to Role and Mission

The MCC Mission Statement is "Metropolitan Community College delivers relevant, student-centered education to a diverse community of learners." By partnering with local industry partners and national biotechnology organizations, MCC will provide a curriculum that will give students an opportunity to gain industry-relevant biotechnology skills and practical hands-on job experience. This will enable students to seek employment as entry-level technicians with local biotechnology companies.

B. Evidence of Need and Demand

1. Need for the program:
There is an increasing need for trained biotechnology employees in the greater Omaha region. This need is not being met according to our industry partners. For example, several companies have indicated that they have a 20% turnover rate or higher. Since they have had difficulty filling technician positions, some companies have modified the requirements listed in job postings for these positions. Therefore, companies need to spend more time training new hires, which can take from six to eighteen months, before they can function independently.

Employment:
The total value of the U.S. bioeconomy is estimated at nearly $1 trillion. Private companies have announced $29 billion in biomanufacturing investments since 2020. In Nebraska, the bioscience industry employment in 2021 was 18,147 and employment was 2,135,704 in the U.S. The average wage in the biosciences industry in 2021 was $82,718 compared to the private sector average wage at $54,000. From 2018-2021, the change in growth of salary had increased by 18%.

The number of bioscience industry establishments in NE was 1,424 in 2021 and in the U.S. there were 127,389 establishments. In Nebraska, employment growth was 2.9% and nationally it was 11%. Nebraska is considered a prime place for new biotechnology companies to locate, and MCC establishing an educational training program will help the state attract more companies. The Cargill site in Blair has been discussed on a national level as a model setup for the use of sugar extracted from corn to be used by other biotech companies integrated on the same campus. Corn is a valuable and plentiful resource for biotech companies to utilize in the state.

Bioscience processes are increasingly being used to make products that are extremely useful in both the U.S. and international markets such as human and animal health, agricultural products, proteins and enzymes, medical devices, and other biologics. Biotechnology is one of the 10 key technology areas established as a focus within the CHIPS and Science Act, and a portion of the $2 billion will be allocated to STEM workforce training related to biomanufacturing. This act authorizes an increase in overall funding for the NSF (National

Science Foundation) amounting to $81 billion over Fiscal Years 2023–2027 which would double the agency's budget.

2. Demand for the program:
The unemployment rate in Nebraska is 2.8% with the unemployment rate for the MCC four-county service area at 2.3%. Even though these rates are low, companies are finding it more challenging to find qualified or trained employees to fill open positions. The Omaha Metro area has around 850,000 people and makes up about 43% of the state's population. There are many future students in this population that could benefit from a local biotechnology training program that leads to employment with a salary starting in the $50-60K range and a competitive benefits package.

One main goal of the Biotechnology Degree Program at Metropolitan Community College would be to help local companies decrease training time by providing training in science concepts, industry-related knowledge, and biotechnology laboratory techniques. Graduates of the program would also possess the skills to be employed in other similar job areas such as Pharmaceuticals Manufacturing, Food Science, and Bioprocessing, thus further increasing the job opportunities.

MCC has been in discussions with area biotechnology companies to determine their workforce needs including the skills required of entry-level biotechnicians. The following companies have shared their average number of technician job openings, which are listed below:

Phibro Animal Health Corporation: 10-20
Merck Animal Health: 20+
Evonik: 10-20
Streck: 10-20
Cargill: 20+

<u>List of local Biotechnology Companies</u>:
Merck Animal Health: (Elkhorn)
Cargill: (Blair)
Evonik: (Blair)
Veramaris: (Blair)
Streck: (La Vista)
Syngenta: (Waterloo)
ADS Biotec: (Omaha)
Corbion: (Blair)
Phibro Animal Health Corporation: (Omaha)
Huvepharma: (Lincoln)
Neogen: (Lincoln)
Novonesis: (Blair)
NatureWorks: (Blair)

Based on local industry feedback regarding the need to hire trained technicians the following represents the number of students expected to enroll in the program in each of the first five years of operation:

	Year 1	Year 2	Year 3	Year 4	Year 5
Career Certificate	12	14	16	18	20
Certificate of Achievement	4	6	6	8	8
Associate Degree	4	6	8	10	12

Beyond the three credentials listed above, existing plans in place include summer biotechnology camps for middle school and high school students, future development of a high school academy, and training in the workforce division of the college.

C. Adequacy of Resources

1. Faculty and Staff Resources:

To sufficiently operate the Biotechnology Program, it would require one full-time faculty member plus another full-time Biology department instructor who would devote half their time to this program. There is potential to hire industry professionals qualified to teach as adjuncts in the program. A full-time laboratory coordinator will also be necessary.

2. Physical Facilities

MCC will offer this program in a dedicated space at the Elkhorn Valley Campus. We are engaged with an architectural firm to develop plans for the space with the goal of opening the program in Fall 2026. This space will be industry-reflective in layout and equipment.

3. Instructional Equipment and Informational Resources:

The curriculum based on local industry needs will be developed using various resources:

Subject matter experts from local industry
Austin Community College
Solano Community College
Algae Technology Education Consortium (ATEC)
Southeast Community College (SCC)
University of Nebraska Omaha (UNO)
University of Nebraska Medical Center (UNMC)
Bellevue University
Montgomery Community College
NBC2 – The Northeast Biomanufacturing Center and Collaborative
BABEC (Bay Area Bioscience Education Community)
BioMADE
InnovATEBIO
BioNebraska
Fermentation Collaborative
BioCore Skills Institute (BCSI)

Mentor Connect

Within the college:

Continuing Education
Workforce Division
Career Services
Advising
Faculty members in the Advanced Manufacturing Department

4. Budget Projections:

Refer to attached Table 1 for Projected Expenses and Table 2 for Projected Revenue.

We have converted one full-time biology instructor to work full-time on program development. We plan to hire one more full-time biology instructor to devote ½ time to this project for the 25/26 school year. A full-time lab coordinator will be needed beginning during the 25/26 school year.

Space at Elkhorn Valley Campus is be converted to build an industry reflective lab space. We are currently in the design phase. Construction will take place during the 25/26 school year to be open for the fall of 2026. We will be using existing state funds to build out and equip the lab. We are seeking an NSF ATE grant along with other local foundation grants and are working on support from our local industries to help cover the costs of building and equipping the lab space.

D. Avoidance of Unnecessary Duplication

1. Similar programs offered in the state of Nebraska:
    - Southeast Community College (Lincoln)

2. Similar programs offered in neighboring states
    - Des Moines Area Community College (Iowa)
    - Kansas City Kansas Community College (Kansas)
    - Front Range Community College (Colorado)
    - St. Louis Community College (Missouri)
    - St. Charles Community College (Missouri)
    - Northern State University (South Dakota)

E. Consistency with the Comprehensive Statewide Plan for Postsecondary Education

Major Statewide Goals:

The proposed MCC Biotechnology Program is consistent with the statewide goals featured in Nebraska's Comprehensive Statewide Plan for Postsecondary Education by:

- Meeting the needs of students: A Biotechnology training program is currently not offered in MCC's four-county service area. Therefore, students living in MCC's four-county service area must travel to Lincoln or other states to seek education and training in this pathway.

- Meeting the state's needs: As part of the investigation, local biotechnology companies throughout MCC's four-county service area were interviewed. During the interview process, each manager confirmed there is currently a lack of qualified technicians and formal education and training programs would be of great value.

- Meeting educational needs through partnerships and collaboration: As identified within this document, MCC is currently in discussions with industry leaders and will offer industry-specific education and training to students enrolled in the Biotechnology degree path. MCC has begun partnerships, discussions, or collaborations with:
    - academic institutions (SCC, UNL, UNO, UNMC, College of St. Mary's, Bellevue University)
    - equipment businesses such as ThermoFisher, BioRAD, and VWR
    - state organizations such as BioNebraska and the Fermentation Collaborative
    - national organizations such as BioMADE, InnovATEBIO, BABEC, and Mentor Connect

- Facilities Planning to Meet Educational Needs: This program is projected to be offered in a new laboratory space located at the Elkhorn Valley Campus.