**NARRATIVE TEMPLATE for a (credit) Traditional Associate Degree: Associate in Arts (A.A.) and Associate in Science (A.S.)**

**Please adhere to the following format conventions:**

* Use the heading (item) and numbering convention (for example: Item 1. Program Goals and Objectives).
* Ensure the description provided under each item is removed from the narrative prior to submission.

**Item 1. Program Goals and Objectives**

The associate in science (AS) degree in research and development is aligned with MiraCosta’s mission as a career and technical education program and as an effort to support the economic and educational well-being of the communities served. This modified research and development degree explicitly builds upon the College’s existing biotechnology certificates. The modified AS degree allows students who complete this local associate degree to obtain entry-level employment in laboratories at local companies and research institutions.

The modified research and development program will serve the needs of the growing biotechnology economic sector in San Diego County. There will be significant growth in biotechnology positions in coming years, and MiraCosta College’s AS degree is well-positioned to serve this need.

The MiraCosta Community College Educational Plan 2016-2020 (addendum to the college’s Comprehensive Master Plan 2011-2020) contains 14 institutional objectives that describe strategies for achieving the College’s five institutional goals. The modified degree program in research and development is aligned with Institutional Goal I, as an innovative practice that will broaden access to higher education for students, Institutional Goal II, as an institution that maximizes student success, and Institutional Goal V, as a conscientious community partner in serving to provide students with the needed skills to participate in the growing biotechnology sector.

The modified associate in science degree program will prepare students for careers a laboratory technician/assistant/associate, process development technician/associate, and quality control technician/associate/analyst. The modification adds coursework options in advanced skills, such as CRISPR gene editing, and curriculum exploring the impact of biotechnology and workforce skills needed for this growing industry. These modifications were proposed after discussions with the advisory board and local companies during individual site visits. Upon completion of this program, students will be able to successfully perform a technical laboratory task common to the technical laboratory environment by employing the appropriate equipment and tools, safely and effectively.

**Item 2. Catalog Description**

**Description**

This associate degree is designed to meet the increasing need for entry-level laboratory technicians, especially in the field of research and development. Technicians in this field must be proficient in the application of scientific methodology to solve problems. They must learn and implement laboratory procedures and use specialized laboratory equipment. Competency in organizational, computational, and communication skills is required. This program is designed to give students the theoretical background and practical experience necessary to be a bench-level scientist in both academic and industrial settings. Completion of this program prepares students to gain entry-level employment, or with additional coursework students can transfer to four-year institutions in the biosciences. Graduates of this biotechnology program can expect to be employed in various capacities, including quality control, applied research, product development, analytical testing, and academic (basic) research.

**Career Opportunities**

The current workforce demand for students with academic experience in biotechnology and laboratory skills is well documented. Career opportunities exist as a laboratory technician/assistant/associate, process development technician/associate, and quality control technician/associate/analyst.

**Program Learning Outcomes**

Upon completion of the program, students will report that they were sufficiently developed to meet employer expectations for entry-level performance in a technical laboratory.

**Item 3. Program Requirements**

**A.S. Research and Development**

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| --- | --- | --- | --- | --- | --- | --- |
| **Requirements** | **Dept. Name/#** | **Name** | **Units** | **CSU-GE** | **IGETC** | **Sequence** |
| Required Core (12 units) | BTEC107  BTEC110  (110H)  BTEC120  BTEC210 | Exploring Biotechnology: Emerging Trends, Careers, and the Local Industry  Basic Techniques in Biotechnology  Business and Regulatory Practices in Biotechnology  Data Analysis with Excel | 3  5  3  1 | E  NA  NA  NA | NA  NA  NA  NA | Yr 1, Fall  Yr 1, Spring  Yr 2, Fall  Yr 1, Spring |
| One course  (3-4 units) | BIO204  (204H)  BIO105 | Foundations of Biology: Biochemistry, Cell Biology, Genetics, and Molecular Biology  Genes and Technology in Society | 4  3 | B2  B2 | 5B  5B | Yr 1, Fall  Yr 1, Fall |
| One course  (4-5 units) | BTEC180  (180H)  MATH150  (150H) | Biostatistics  Calculus and Analytic Geometry I | 4  5 | B4  B4 | 2A  2A | Yr 1, Spring  Yr 1, Spring |
| Two courses (10 units) | CHEM150(150H)  CHEM151(151H) | General Chemistry (Honors)  General Chemistry (Honors) | 5  5 | B1  B1 | 5A  5A | Yr 2, Fall  Yr 2, Spring |
| Required electives (2 units) | BTEC201  BTEC203  BTEC204  BTEC206  BTEC207  BTEC231  BTEC292  BTEC299 | Advanced Cell Culture  Techniques in DNA Amplification  Recombinant DNA  Principles of Separation and HPLC  Techniques in Immunochemistry and ELISA  Gene Editing Techniques: CRISPER-Cas9  Internship Studies  Occupational Cooperative Work Experience | 1  1  1  1  1  1  1  1 | NA  NA  NA  NA  NA  NA  NA  NA | NA  NA  NA  NA  NA  NA  NA  NA | Yr 2, Spring  Yr 2, Fall  Yr 2, Spring  Yr 2, Spring  Yr 2, Fall  Yr 2, Fall  Yr 2, Spring |
| One course  (4 units) | ENGL100  (100H) | Composition and Reading | 4 | A2 | 1A | Yr 1, Fall |

Required Major Total 35-37 units

Completion of IGETC 40 units

TOTAL UNITS 61-63 units

(Possible double counting of major and GE units)

Proposed Sequence:

Year 1, Fall = 13-14 units

Year 1, Spring = 15-16 units

Year 2, Fall = 17 units

Year 2, Spring = 16 units

TOTAL UNITS: 61-63 units

Minutes from the Biotechnology Industry Advisory Board on May 3, 2019, and February 21, 2020, are included and reflect the confirmation of the degree requirements (21st century skills and technical skills).

**Item 4. Master Planning**

The modified A.S. in research and development is aligned with MiraCosta’s mission as a career and technical education program and as an effort to support the economic and educational well-being of the communities served. The modified degree will better support students as they seek entry-level employment and as preparation for students seeking to transfer to four-year institutions.

The research and development program will serve the needs of the growing biotechnology economic sector in San Diego County. As described in more detail, below, there will be significant growth in biotechnology positions in coming years, and MiraCosta College’s proposed degree will be well-positioned to serve this need.

Further evidence of the degree’s alignment to the College mission is its relationship to MiraCosta’s institutional goals. The MiraCosta Community College District 2011 Comprehensive Master Plan (CMP) covers ten years and consists of an Educational Plan and a Facilities Plan. Both plans are based on thorough research conducted internally and externally over two years. The CMP resulted in the MiraCosta’s adoption of institutional goals, which are intended to advance the mission of the College and address anticipated changes. The MiraCosta College Educational Plan 2016-2020 (addendum to the college’s Comprehensive Master Plan 2011-2020) contains 14 institutional objectives that describe strategies for achieving the College’s five institutional goals. The proposed degree program in research and development is aligned with Institutional Goal I, as an innovative practice that will broaden access to higher education for students, Institutional Goal II, as an institution that maximizes student success, and Institutional Goal V, as a conscientious community partner in serving to provide students with the needed skills to participate in the growing biotechnology sector.

The Life Sciences and Biotech sector accounts for almost 60,000 jobs in the San Diego-Imperial region and about 17% of all Life Sciences and Biotech jobs in California (“Sector Analysis Highlights--Life Sciences and Biotechnology: Middle-Skills Jobs in the San Diego-Imperial Region” by the Centers of Excellence in Spring 2019). The sector is projected to grow 7% between 2018-2023 in both San Diego and Imperial Counties (Centers of Excellence 2019 Sector Analysis). The average earnings per Life Sciences & Biotech job is $127,753 making this a high-wage industry that allows students to be financially independent (“California Life Sciences Sector Report 2020” by the California Life Sciences Association).

The recent analysis by the Centers of Excellence regarding recession- and pandemic-resilient jobs in San Diego indicated that entry-level technician positions (weighers, inspectors, samplers) were resilient to both recessions and the pandemic. This modified degree thus prepares students for employment that allows them to earn a living wage in an industry that has continued to grow despite economic and global health challenges. In the local region, there is a projected supply gap of over 1,100 graduates to fill the annual openings in middle skills positions (Centers of Excellence 2019 Sector Analysis). This provides further justification for the importance of this modified program to prepare students for in-demand jobs.

**Item 5. Enrollment and Completer Projections**

This modified A.S degree in research and development will support students seeking to complete their two-year education for a high-wage, in-demand industry. In recent years, the biotechnology program at MiraCosta has nearly doubled in size from 368 enrollments in 2015-2016 to 673 enrollments in 2018-2019.

As noted in Item 4, there is also a large gap of about 1,100 between employment demand for middle skills workers (1,233 openings per year) and the supply from regional colleges (61 graduates annually) in San Diego County. This supports the adequate demand for the program. The reports referenced above are included in the Supporting Documentation.

**Item 6. Place of Program in Curriculum/Similar Programs**

Before completing this section, review the college’s existing program inventory in the CCC Curriculum Inventory, then address the following questions:

1. Do any active inventory records need to be made inactive or changed in connection with the approval of the proposed program?

No.

1. Does the program replace any existing program(s) on the college’s inventory? Provide relevant details if this program is related to the termination or scaling down of another program(s).

No.

1. What related programs are offered by the college?

Certificate of Achievement in Research and Development

**Item 7. Similar Programs at Other Colleges in Service Area**

Miramar College has an associate degree in biotechnology. This degree program is similar, but does not duplicate our program. Given the large gap between industry workforce demand and supply from regional colleges, there is opportunity for multiple programs to be successful in the region.