

# Biotechnology

## Degree Type

Associate in Science

Biotechnology is a subject area that has enormous implications for the future of the 21st century. It already has a significant impact on our lives and will continue to revolutionize the ways in which we diagnose and treat disease, lengthen life spans, feed the planet, and remediate the environment. Our nationally recognized Biotechnology program prepares students with the skills and knowledge needed to enter the biotechnology industry or to proceed to further education at a four-year college or university. Current graduates may be found in a variety of biotechnology companies, working as Lab Technicians, Manufacturing Associates, Quality Control and Quality Assurance Technicians, and as Validation Consultants.

## Program Outcomes

Students graduating with the A.S. degree in Biotechnology will be able to:

- Understand the role of biotechnology in human experience, past and present.
- Understand the “benchtop to bottle” process of bringing a biopharmaceutical or other biotechnology-based product to market.
- Understand the Central Dogma, and its role as the theoretical foundation of modern biotechnology.
- Understand and be able to apply the scientific method.
- Understand and be able to execute a wide variety of laboratory techniques in microbiology, biochemistry and molecular genetics, including (but not limited to) solution preparation, DNA extraction and amplification, library construction, hybridization, forensic analysis, cell culture, protein production and protein purification.
- Generate and maintain accurate lab documentation, including laboratory notebooks, batch records, logbooks and inventory records.
- Understand and adhere to the documentation guidelines of cGMP, when required.
- Analyze and draw conclusions from generated scientific data, and present findings in a formal laboratory report.
- Understand the basic principles of genomics, proteomics and systems approaches in biotechnology.
- Conduct basic bioinformatics-based analysis.
- Use critical thinking and principles of logic to analyze ethical issues raised in the practice of biotechnology.
- Qualify for entry level work in the biomanufacturing sector of the biotechnology industry.
- Qualify for transfer to a four-year college or university with the necessary foundation in biology, chemistry and mathematics for upper level study in a wide variety of biological disciplines.

## Health, Safety, and Internship Considerations

The Biotechnology program offers an optional externship. Participation in this externship requires the student to follow the College Immunization Policy. Please see the Academic Policies section of this catalog, under XVI. Immunization Policy. Depending upon the site, the student may be required to possess and maintain professional liability insurance. For unpaid externships, the student must possess and maintain accident insurance. Please see the Student Services section of this catalog, under Insurance for purchase options available through the College.

## Technical Standards

Students enrolling in degree and certificate programs, and/or enrolling in individual courses within the Biotechnology Program, in addition to meeting the specific prerequisite requirements for each course, must meet the following general, technical standards:

- Students must be able to comprehend the English language, both oral and written.
- Students must have sufficient manual dexterity to produce legible written documents in a timely manner. Appropriate assistive technology may be used, as needed.
- Students must be able to sit or stand at a desk and laboratory bench and must possess the necessary focus to stay on task for extended periods of time.
- Students must be able to comprehend and follow instructions in the classroom and laboratory in a timely manner.
- Students must possess the necessary manual dexterity to carry out assigned laboratory tasks.
- Students must be able to perform required classroom and laboratory operations, including mathematical operations, without reference to notes, as directed.

### Transfer Credit Policy

In addition to Great Bay transfer credit policies, transfer of courses in Biotechnology more than ten years old will be evaluated by the department chair on an individual basis.

## First Year (Pathway I)

### Fall Semester

| Item #   | Title                    | Theory Hours | Lab Hours  | Credits      |
|----------|--------------------------|--------------|------------|--------------|
|          | Social Science Elective* | 3            | 0          | 3-4          |
| BIOL108G | General Biology I        | 3            | 3          | 4            |
|          | ENGL110G/111G            | 4            | 0          | 4-5          |
|          | MATH145G/ MATH147G       | 4            | 0          | 4-5          |
|          | <b>Sub-Total Credits</b> | <b>14-16</b> | <b>3-5</b> | <b>15-18</b> |

### Spring Semester

| Item #   | Title                         | Theory Hours | Lab Hours | Credits   |
|----------|-------------------------------|--------------|-----------|-----------|
| BTEC205G | Bioethics                     | 3            | 0         | 3         |
| CHEM115G | General Chemistry I           | 3            | 3         | 4         |
| BTEC105G | Introduction to Biotechnology | 3            | 3         | 4         |
| MATH225G | Probability and Statistics    | 4            | 0         | 4         |
|          | <b>Sub-Total Credits</b>      | <b>13</b>    | <b>6</b>  | <b>15</b> |

PHIL240G Ethics may be substituted for BTEC205G Bioethics.

## Second Year

### Fall Semester

| Item #   | Title                                           | Theory Hours | Lab Hours   | Credits      |
|----------|-------------------------------------------------|--------------|-------------|--------------|
| BTEC210G | Biotechnology Research                          | 2            | 6           | 4            |
| BIOL109G | General Biology II                              | 3            | 3           | 4            |
|          | Technical Elective                              | 3            | 0           | 3-4          |
|          | Technical Elective                              | 3            | 0           | 3-4          |
|          | Humanities/Foreign Language/Fine Arts Elective* | 3            | 0           | 3            |
|          | <b>Sub-Total Credits</b>                        | <b>14-16</b> | <b>9-15</b> | <b>17-19</b> |

### Spring Semester

| Item #   | Title                    | Theory Hours | Lab Hours   | Credits      |
|----------|--------------------------|--------------|-------------|--------------|
| BTEC220G | Biomanufacturing         | 2            | 6           | 4            |
| BIOL210G | Microbiology             | 3            | 3           | 4            |
|          | Technical Elective       | 3            | 0           | 3-4          |
|          | Technical Elective       | 3            | 0           | 3-4          |
|          | <b>Sub-Total Credits</b> | <b>11-13</b> | <b>9-15</b> | <b>14-16</b> |

## First Year (Pathway II)

| Item #   | Title                    | Theory Hours | Lab Hours  | Credits      |
|----------|--------------------------|--------------|------------|--------------|
| CHEM115G | General Chemistry I      | 3            | 3          | 4            |
| BIOL108G | General Biology I        | 3            | 3          | 4            |
|          | MATH150/152G (Biotech)   | 4            | 0          | 4-5          |
|          | ENGL110G/111G            | 4            | 0          | 4-5          |
|          | <b>Sub-Total Credits</b> | <b>14-15</b> | <b>6-8</b> | <b>16-18</b> |

### Spring Semester

| Item #   | Title                         | Theory Hours | Lab Hours | Credits   |
|----------|-------------------------------|--------------|-----------|-----------|
| BTEC205G | Bioethics                     | 3            | 0         | 3         |
| CHEM116G | General Chemistry II          | 3            | 3         | 4         |
| BTEC105G | Introduction to Biotechnology | 3            | 3         | 4         |
| MATH210G | Pre-Calculus                  | 4            | 0         | 4         |
|          | <b>Sub-Total Credits</b>      | <b>13</b>    | <b>6</b>  | <b>15</b> |

[PHIL240G](#) Ethics may be substituted for [BTEC205G](#) Bioethics.

[MATH210G](#): A higher-level MATH may be substituted.

## Second Year

### Fall Semester

| Item #   | Title                                           | Theory Hours | Lab Hours    | Credits      |
|----------|-------------------------------------------------|--------------|--------------|--------------|
| BTEC210G | Biotechnology Research                          | 2            | 6            | 4            |
| BIOL210G | Microbiology                                    | 3            | 3            | 4            |
| BIOL109G | General Biology II                              | 3            | 3            | 4            |
|          | Technical Elective                              | 3            | 0            | 3-4          |
|          | Humanities/Foreign Language/Fine Arts Elective* | 3            | 0            | 3            |
|          | <b>Sub-Total Credits</b>                        | <b>14-15</b> | <b>12-15</b> | <b>18-19</b> |

Students may want to consider taking one of these courses during the summer term.

## Spring Semester

| Item #   | Title                    | Theory Hours | Lab Hours   | Credits      |
|----------|--------------------------|--------------|-------------|--------------|
| BTEC220G | Biomanufacturing         | 2            | 6           | 4            |
|          | Social Science Elective* | 3            | 0           | 3-4          |
|          | Technical Elective       | 3            | 0           | 3-4          |
|          | Technical Elective       | 3            | 0           | 3-4          |
|          | <b>Sub-Total Credits</b> | <b>11-14</b> | <b>6-12</b> | <b>13-16</b> |
|          | <b>Total Credits</b>     |              |             | <b>62-67</b> |