BIOTECHNOLOGY, ASSOCIATE IN APPLIED SCIENCE

The Biotechnology Associate in Applied Science program provides the required knowledge and skill set for students pursuing entry-level career opportunities in the biotech industry. Students will receive hands on training in the biomanufacturing of biopharmaceutical products by bacteria, yeast, algae, and eukaryotic cell lines. Students will receive training in the soft skills (written and oral communication, interviewing, leadership, networking, and critical thinking) which will enhance their employability.

Program Requirements

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOLOGY 121</td>
<td>Biology I</td>
<td>5</td>
</tr>
<tr>
<td>CIS 103</td>
<td>Fundamentals of Programming</td>
<td>3</td>
</tr>
<tr>
<td>ENGLISH 101</td>
<td>Composition</td>
<td>3</td>
</tr>
<tr>
<td>INTDSP 104</td>
<td>College Success: Special Topics</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td>General Education Human Diversity course</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 201</td>
<td>General Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 203</td>
<td>General Chemistry II</td>
<td>5</td>
</tr>
<tr>
<td>MCROBIO 233</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>MCROBIO 234</td>
<td>Applied Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOTECH 201</td>
<td>Survey Of Biotechnology</td>
<td>2</td>
</tr>
<tr>
<td>BIOTECH 211</td>
<td>Laboratory Math for Biotechnology</td>
<td>2</td>
</tr>
<tr>
<td>BIOTECH 212</td>
<td>Basic Laboratory Skills and Safety</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 220</td>
<td>Cell Culture Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 225</td>
<td>Biotechnology Techniques</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 230</td>
<td>Molecular Biology Techniques</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 235</td>
<td>Biotechnology Techniques 2</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 245</td>
<td>Bioinformatics</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 262</td>
<td>Biomanufacturing</td>
<td>4</td>
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<tr>
<td>BIOTECH 299</td>
<td>Internship in Biotechnology</td>
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</table>

Total Hours: 61

1 Students must complete a Work-Based Learning course in the summer between year 1 and year 2

Pathway

This is an example course sequence for students interested in earning a Associate in Applied Science (AAS) in Biotechnology. If this pathway is followed as outlined, you will earn a Basic Certificate. It does not represent a contract, nor does it guarantee course availability.

Semester-by-Semester Program Plan for Full-Time Students

All plans can be modified to fit the needs of part-time students by adding more semesters.

Semester 1

<table>
<thead>
<tr>
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<th>Hours</th>
</tr>
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<tbody>
<tr>
<td>BIOLOGY 121</td>
<td>Biology I</td>
<td>5</td>
</tr>
<tr>
<td>BIOTECH 201</td>
<td>Survey Of Biotechnology</td>
<td>2</td>
</tr>
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<td>BIOTECH 211</td>
<td>Laboratory Math for Biotechnology</td>
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<td>BIOTECH 212</td>
<td>Basic Laboratory Skills and Safety</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 220</td>
<td>Cell Culture Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 225</td>
<td>Biotechnology Techniques</td>
<td>3</td>
</tr>
<tr>
<td>BIOTECH 230</td>
<td>Molecular Biology Techniques</td>
<td>3</td>
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</table>

Hours: 15

Semester 2

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 203</td>
<td>General Chemistry II</td>
<td>5</td>
</tr>
<tr>
<td>BIOTECH 212</td>
<td>Basic Laboratory Skills and Safety</td>
<td>3</td>
</tr>
<tr>
<td>ENGLISH 101</td>
<td>Composition</td>
<td>3</td>
</tr>
<tr>
<td>MCROBIO 233</td>
<td>General Microbiology</td>
<td>4</td>
</tr>
</tbody>
</table>

Hours: 15
Semester 3
BIOTECH 299 Internship in Biotechnology 2

Semester 4
BIOTECH 220 Cell Culture Laboratory 3
BIOTECH 225 Biotechnology Techniques 3
BIOTECH 230 Molecular Biology Techniques 3
MCROBIO 234 Applied Microbiology 4

Semester 5
BIOTECH 235 Biotechnology Techniques 2 3
BIOTECH 245 Bioinformatics 3
BIOTECH 262 Biomanufacturing 4
CIS 103 Fundamentals of Programming (HD) 3

Human Diversity Course 3

Total Hours 61

Choose your courses with your College Advisor.

Careers
This program can prepare students for the jobs listed below. Click on each one to learn more, including average earnings, annual job openings, and how much education people in that field have. For additional guidance and resources on career options, current City Colleges students and alumni can contact the Career Services Office (https://www.ccc.edu/departments/Pages/Career-Services.aspx).

Biological Technicians
Job Description
Assist biological and medical scientists. Set up, operate, and maintain laboratory instruments and equipment, monitor experiments, collect data and samples, make observations, and calculate and record results. May analyze organic substances, such as blood, food, and drugs.

Salary Based on Experience Level
Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

Annual Wages
Entry-Level 10th Percentile $34,827
Median 50th Percentile $51,597
Senior-Level 90th Percentile $100,316

Hourly Wages
Entry-Level 10th Percentile $17
Median 50th Percentile $25
Senior-Level 90th Percentile $48

Annual Job Openings
57 annual openings in Cook County

National Education Attainment
Here, you can see the level of education that people in this career complete.

Degree Program % of Jobs
A high school diploma or less 4.55%
A certificate 4.55%
Some college 0.00%
An Associate degree 22.73%

Environmental Science and Protection Technicians, Including Health
Job Description
Perform laboratory and field tests to monitor the environment and investigate sources of pollution, including those that affect health, under the direction of an environmental scientist, engineer, or other specialist. May collect samples of gases, soil, water, and other materials for testing.

Salary Based on Experience Level
Take a look at the average hourly/annual earnings for this career in Cook County

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Annual Wages
Entry-Level 10th Percentile $34,827
Median 50th Percentile $51,597
Senior-Level 90th Percentile $100,316

Hourly Wages
Entry-Level 10th Percentile $17
Median 50th Percentile $25
Senior-Level 90th Percentile $48

Annual Job Openings
57 annual openings in Cook County

National Education Attainment
Here, you can see the level of education that people in this career complete.

Degree Program % of Jobs
A high school diploma or less 4.55%
A certificate 4.55%
Some college 0.00%
An Associate degree 22.73%
A Bachelor's degree 68.18%
A Master's or Professional degree 0.00%
A Doctoral degree or more 0.00%

68.18% continue their education beyond an associate degree

Agricultural Technicians
Job Description
Work with agricultural scientists in plant, fiber, and animal research, or assist with animal breeding and nutrition. Set up or maintain laboratory equipment and collect samples from crops or animals. Prepare specimens or record data to assist scientists in biology or related life science experiments. Conduct tests and experiments to improve yield and quality of crops or to increase the resistance of plants and animals to disease or insects.

Salary Based on Experience Level
Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

Annual Wages
Entry-Level 10th Percentile $32,468
Median 50th Percentile $42,903
Senior-Level 90th Percentile $74,374

Hourly Wages
Entry-Level 10th Percentile $16
Median 50th Percentile $21
Senior-Level 90th Percentile $36

Annual Job Openings
32 annual openings in Cook County

National Education Attainment
Here, you can see the level of education that people in this career complete.

Degree Program % of Jobs
A high school diploma or less 2.18%
A certificate 0.00%
Some college 0.00%
An Associate degree 18.32%
A Bachelor's degree 30.45%
A Master's or Professional degree 49.05%
A Doctoral degree or more 0.00%

79.50% continue their education beyond an associate degree

Food Science Technicians
Job Description
Work with food scientists or technologists to perform standardized qualitative and quantitative tests to determine physical or chemical properties of food or beverage products. Includes technicians who assist in research and development of production technology, quality control, packaging, processing, and use of foods.

Salary Based on Experience Level
Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

Annual Wages
Entry-Level 10th Percentile $43,552
Median 50th Percentile $61,661
Senior-Level 90th Percentile $86,843

Hourly Wages
Entry-Level 10th Percentile $21
Median 50th Percentile $30
Senior-Level 90th Percentile $42

Annual Job Openings
17 annual openings in Cook County

National Education Attainment
Here, you can see the level of education that people in this career complete.

Degree Program % of Jobs
A high school diploma or less 17.11%
A certificate 0.00%
Some college 12.35%
An Associate degree 23.04%
A Bachelor's degree 32.33%
A Master's or Professional degree 12.78%
A Doctoral degree or more 2.38%

47.49% continue their education beyond an associate degree

Environmental Scientists and Specialists, Including Health
Job Description
Conduct research or perform investigation for the purpose of identifying, abating, or eliminating sources of pollutants or hazards that affect either the environment or public health. Using knowledge of various scientific disciplines, may collect, synthesize, study, report, and recommend action
based on data derived from measurements or observations of air, food,
soil, water, and other sources.

**Salary Based on Experience Level**

Take a look at the average hourly/annual earnings for this career in Cook County

Lightcast earnings figures are based on OES data from the BLS and include base rate, cost of living allowances, guaranteed pay, hazardous-duty pay, incentive pay (including commissions and bonuses), on-call pay, and tips.

**Annual Wages**

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Entry-Level 10&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Median 50&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Senior-Level 90&lt;sup&gt;th&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentile</td>
<td>$53,482</td>
<td>$79,257</td>
<td>$146,988</td>
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</table>

**Hourly Wages**

<table>
<thead>
<tr>
<th>Percentile</th>
<th>Entry-Level 10&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Median 50&lt;sup&gt;th&lt;/sup&gt;</th>
<th>Senior-Level 90&lt;sup&gt;th&lt;/sup&gt;</th>
</tr>
</thead>
<tbody>
<tr>
<td>Percentile</td>
<td>$26</td>
<td>$38</td>
<td>$71</td>
</tr>
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</table>

**Annual Job Openings**

70 annual openings in Cook County

**National Education Attainment**

Here, you can see the level of education that people in this career complete.

<table>
<thead>
<tr>
<th>Degree Program</th>
<th>% of Jobs</th>
</tr>
</thead>
<tbody>
<tr>
<td>A high school diploma or less</td>
<td>21.32%</td>
</tr>
<tr>
<td>A certificate</td>
<td>0.00%</td>
</tr>
<tr>
<td>Some college</td>
<td>0.76%</td>
</tr>
<tr>
<td>An Associate degree</td>
<td>0.00%</td>
</tr>
<tr>
<td>A Bachelor’s degree</td>
<td>60.15%</td>
</tr>
<tr>
<td>A Master’s or Professional degree</td>
<td>13.78%</td>
</tr>
<tr>
<td>A Doctoral degree or more</td>
<td>3.99%</td>
</tr>
</tbody>
</table>

77.92% continue their education beyond an associate degree