BIOTECHNOLOGY MAJOR  
(B.S.)

https://manchester.unh.edu/program/bs/biotechnology-major

Description

Biotechnology is the use of living organisms, biological systems, and small chemicals and biomolecules in technology. Biotechnology has applications in the treatment of diseases, the production of food, the protection of ecosystems, and the generation of energy, as well as in the basic science study of many biological questions.

The B.S. in biotechnology at UNH Manchester is designed to:

1. allow students to earn a baccalaureate degree in biotechnology at UNH;
2. allow students to combine study in biotechnology with other programs and disciplines by completing a minor, or a self-designed set of elective courses along with their biotechnology degree;
3. allow students to complete a major in biotechnology while taking required courses in education in preparation for the five-year M.A.T. or M.Ed. programs and state certification in secondary science education; or alternative state certification pathway;
4. provide an opportunity for students to complete a baccalaureate degree in biotechnology while completing the required courses for admission to medical, dental, veterinary, physician assistant, pharmacy, physical therapy, optometry, and other professional or graduate programs.
5. allow students to complete a baccalaureate degree in biotechnology while completing the required courses for admission to graduate research programs (M.S. or Ph.D.) in the life sciences and related fields.

Employment opportunities in the public and private sectors include education; research laboratories; clinical laboratories; forensic laboratories; jobs in diverse areas from research to quality control to sales in the pharmaceutical industry; industrial positions in the food industry; water and wastewater laboratories and facilities; and environmental research and monitoring.

Requirements

Students must complete a minimum of 128 credits and satisfy the University’s Discovery Program and writing requirement. Each course required in the major must be completed with a minimum grade of C-. Students must attain a minimum GPA in the major of 2.0. Transfer students must complete at least 24 credits in the major at UNH.

BIOL 413 Principles of Biology I and BIOL 414 Principles of Biology II can be used to satisfy the biological sciences Discovery requirement and CHEM 403 General Chemistry I. CHEM 404 General Chemistry II may be used to satisfy the Physical Sciences Discovery requirement. PSYC 402 Statistics in Psychology or MATH 424B Calculus for Life Sciences/MATH 425 Calculus I may be used to satisfy the Quantitative Reasoning Discovery requirement.

The UNH Manchester B.S. in biotechnology program is structured with three levels of coursework.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 413 &amp; BIOL 414</td>
<td>Principles of Biology I and Principles of Biology II</td>
<td>8</td>
</tr>
<tr>
<td>BMS 503 &amp; BMS 504</td>
<td>General Microbiology and General Microbiology Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>GEN 604</td>
<td>Principles of Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BSCI 501</td>
<td>Ethical Issues in Biology</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 403 &amp; CHEM 404</td>
<td>General Chemistry I and General Chemistry II</td>
<td>8</td>
</tr>
<tr>
<td>CHEM 651 &amp; CHEM 653</td>
<td>Organic Chemistry I and Organic Chemistry Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 652 &amp; CHEM 654</td>
<td>Organic Chemistry II and Organic Chemistry Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>BMCB 658 &amp; BMCB 659</td>
<td>General Biochemistry and General Biochemistry Lab</td>
<td>5</td>
</tr>
<tr>
<td>PHYS 401 or PHYS 407</td>
<td>Introduction to Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PSYC 402</td>
<td>Statistics in Psychology</td>
<td>4</td>
</tr>
<tr>
<td>MATH 424B or MATH 425</td>
<td>Calculus for Life Sciences</td>
<td>4</td>
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Advanced Biology Courses (600/700 level)

Select five courses (at least one course from each of the three categories) to total 20 credits.

I. Advanced Biology courses

- GEN 711W: Genomics and Bioinformatics
- GEN 714: Personal Genomics
- GEN 771: Molecular Genetics
- BMS 702: Endocrinology
- BMS 705, BMS 705 & BMS 715: Immunology
- BSCI 620: Global Science Exploration
- BSCI 670: Clinical Pathophysiology
- BSCI 680: Pharmacology
- BSCI 692: Evolutionary Medicine
- BSCI 695: Exploring Biology Teaching (1-4 credits)
- BSCI 735: Cell Biology
- BSCI 750: Cancer Biology: From Benchtop Research to Therapeutic Interventions

II. Laboratory Techniques courses

- BMCB 753: Cell Culture
- BSCI #765: Nucleic Acid Techniques
- BSCI 766: Protein and Immunologic Techniques
- BSCI 777: Molecular Biology and Biotechnology
- CHE 651: Biotech Experience/Blomanchuring (BTEC 220 GBCC)
- ZOOL 625, ZOOL 626: Principles of Animal Physiology and Animal Physiology Laboratory

III. Advanced Microbiology courses

- BMS 601: Bacteriology of Food
- BMS 602 & BMS 603: Pathogenic Microbiology and Pathogenic Microbiology Laboratory
Biotechnology Major (B.S.)

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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</thead>
<tbody>
<tr>
<td>BMS 706</td>
<td>Virology and Virology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BMS 708</td>
<td></td>
<td></td>
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<tr>
<td>BSCI 737</td>
<td>Microbial Genomics</td>
<td></td>
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<tr>
<td>BSCI 740</td>
<td>Aquatic Microbiology</td>
<td></td>
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</tbody>
</table>

Total Credits 76

1 BMS 705 Immunology, may optionally be taken with or without BMS 715 Immunology Laboratory.

Depending on their specific academic and career goals and in consultation with their advisor, students may elect to take additional supporting science courses and a full year of physics (adding PHYS 402 Introduction to Physics II to PHYS 401 Introduction to Physics I listed above). These courses are often required for admission to medical, veterinary, and other professional and graduate programs.

### Capstone Experience

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BSCI 701</td>
<td>Senior Seminar I (during either semester of the senior year)</td>
<td>1</td>
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</tbody>
</table>

Select a capstone experience, such as the following:

- BSCI 792  Research
- BSCI 793  Internship
- BSCI 794  Clinical Microbiology Internship
- BSCI 795  Independent Study

Total Credits 5

BSCI 701 Senior Seminar I will meet weekly during either semester of the senior year in a seminar format. Students will share information about capstone experiences, listen to presentations on timely issues in biology, develop career preparation skills, and provide training in poster production. Other methods of oral presentation and scientific writing are explored as students prepare to present the results of their capstone activities at the Undergraduate Research Conference or other venues.

In addition, all students will take elective courses to fulfill the 128-credit requirement for a B.S. degree. These elective courses could fulfill the requirements for a major or minor in another program or they could fulfill a self-designed interdisciplinary concentration. These courses would be selected in consultation with the advisor and the appropriate faculty advisor in another program.

For more information, contact Stephen Pugh (Stephen.Pugh@unh.edu), program coordinator; or contact the Office of Admissions (unhm.admissions@unh.edu), (603) 641-4150.

## Sample Plan

### Degree Plan

#### Sample Course Sequence

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>First Year</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Fall</strong></td>
<td></td>
<td></td>
</tr>
<tr>
<td>BIOL 413</td>
<td>Principles of Biology I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 403</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>ENGL 401</td>
<td>First-Year Writing</td>
<td>4</td>
</tr>
<tr>
<td>MATH 425</td>
<td>Calculus I</td>
<td>4</td>
</tr>
</tbody>
</table>

| UMST 401     | First Year Seminar                | 1       |

**Spring**

- BIOL 414  Principles of Biology II 4
- CHEM 404  General Chemistry II    4
- PSYC 402  Statistics in Psychology 4
- Discovery Course                   4

**Second Year**

**Fall**

- BSCI 501  Ethical Issues in Biology 4
- CHEM 651  Organic Chemistry I      5
- & CHEM 653 Organic Chemistry Laboratory 5
- Discovery Course                   4
- Discovery Course                   4

**Spring**

- BMS 503  General Microbiology      5
- & BMS 504 General Microbiology Laboratory 5
- CHEM 652  Organic Chemistry II     5
- & CHEM 654 Organic Chemistry Laboratory 5
- GEN 604  Principles of Genetics   4
- Discovery Course                   4

**Third Year**

**Fall**

- 600/700 Biotechnology Concentration 4
- PHYS 401  Introduction to Physics I 4
- Discovery Course                     4
- Elective Course                      4

**Spring**

- 600/700 Biotechnology Concentration 4
- BMCB 658  General Biochemistry      5
- & BMCB 659 General Biochemistry Lab 5
- Discovery Course                     4
- Elective Course                      4

**Fourth Year**

**Fall**

- 600/700 Biotechnology Concentration 4
- 600/700 Biotechnology Concentration 4
- Capstone                             4
- Elective Course                      4

**Spring**

- 600/700 Biotechnology Concentration 4
- BSCI 701  Senior Seminar I          1
- Elective Course                      4
- Elective Course                      4

**Total Credits** 130