BIOCHEMISTRY, MOLECULAR AND CELLULAR BIOLOGY MAJOR (B.S.)

https://colsa.unh.edu/molecular-cellular-biomedical-sciences/program/bs/biochemistry-molecular-cellular-biology-major

Description

The Biochemistry, Molecular & Cellular Biology (BMCB) major provides you with conceptual competence, analytical skills, and laboratory experiences to understand life at the molecular and cellular level. Your BMCB degree will prepare you for immediate employment as a research associate or for entry into graduate or professional programs in medicine, dentistry or other allied health professions, as well as other career tracks.

The BMCB program offers advanced coursework and laboratories in diverse research areas of modern biology

- Cancer biology
- Cell biology
- Cell culture & tissue engineering
- Endocrinology
- Molecular biology
- Pharmacology
- Physical biochemistry
- Protein structure, function & proteomics

BMCB majors participate in experiential learning activities

- Many courses have integrated laboratory experiences to foster inquiry-based learning and to train creative and critical thinkers
- Independent research experiences are available in faculty research laboratories
- Many courses provide exposure to cutting-edge techniques and instrumentation
- Job preparation can be enhanced by internships with regional biotechnology and pharmaceutical companies
- Summer undergraduate research fellowships at U.S. or international academic institutions combine travel with research opportunities outside UNH

BMCB graduates have been successful in many careers

- Research associates and laboratory technicians
- Biotechnology and pharmaceutical companies
- Government agencies
- Forensics laboratories
- Academic research laboratories
- Hospitals
- Science journalists and technical writers
- Healthcare workers
- Pharmaceutical sales and marketing staff
- Regulatory agency staff

- Primary and secondary school educators (with additional coursework in education)

BMCB graduates are well prepared for post-baccalaureate education

- Masters and doctoral programs in a wide variety of disciplines
- Professional health programs
  - Medical
  - Dental
  - Pharmacy
- Physician’s Assistant and other allied health programs

Note: The BMCB major is designed so you can complete all of the prerequisite courses needed to seek admission to graduate schools or health professional schools in four years.

Requirements

Students in the Biochemistry, Molecular and Cellular Biology (BMCB) major take eight Foundation courses, four Bioscience Core courses, five BMCB Core courses, one Laboratory Techniques course, and three Major Elective courses. One capstone experience, supervised and approved within the major, is required of all seniors. In addition, all other University academic requirements must be completed, including those for the Discovery Program and the University Writing Requirement.

A grade of C-minus or better is required in Statistics and in all Bioscience Core, BMCB Core, Laboratory Techniques, and Major Elective courses.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>CHEM 403</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 404</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 547</td>
<td>Organic Chemistry I &amp; Organic Chemistry Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>CHEM 548</td>
<td>Organic Chemistry II &amp; Organic Chemistry Laboratory</td>
<td>5</td>
</tr>
<tr>
<td>MATH 424</td>
<td>Calculus for Life Sciences</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 528</td>
<td>Applied Biostatistics</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 401</td>
<td>Introduction to Physics I</td>
<td>4</td>
</tr>
<tr>
<td>PHYS 402</td>
<td>Introduction to Physics II</td>
<td>4</td>
</tr>
</tbody>
</table>

1 Fulfills Physical Science Discovery requirement
2 CHEM 651/653 & CHEM 652/654 can be substituted for CHEM 547/549 & CHEM 548/550
3 Fulfills Quantitative Reasoning Discovery requirement
4 MATH 425 and MATH 426 can be substituted for MATH 424B and BIOL 528
5 PHYS 407 and PHYS 408 can be substituted for PHYS 401 and PHYS 402

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 411</td>
<td>Introductory Biology Molecular and Cellular</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 412</td>
<td>Introductory Biology Evolution, Biodiversity and Ecology</td>
<td>4</td>
</tr>
<tr>
<td>BMS 503</td>
<td>General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>GEN 604</td>
<td>Principles of Genetics</td>
<td>4</td>
</tr>
</tbody>
</table>

6 BIOL 411 fulfills the Biological Science Discovery requirement, Discovery Laboratory requirement, and Discovery Inquiry requirement
A total of three unique major electives is required.

In addition to the major electives, taking GEN 725 Population Genetics Lab is recommended, but not required.

Approved BMCB Capstone Courses

The capstone explores areas of interest based on the integration of prior learning. The capstone requirement may be satisfied through a course, created work or product, or some form of experiential learning (e.g., honors thesis, mentored research project, or other special student activity). Students may take more than one capstone course. Capstone completion is never displayed on Degree Works; your advisor will certify capstone completion at the time of graduation. Students must have 90 credits or more when completing their capstone requirement. See your advisor for questions about capstones.

For a capstone experience not listed above, such as an internship, submit a Capstone Approval form prior to beginning the experience.

Degree Plan

SAMPLE Course Sequence for Biochemistry, Molecular, and Cellular Biology

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>First Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>BMCB 401</td>
<td>Professional Perspectives in Biochemistry, Molecular and Cellular Biology</td>
<td>1</td>
</tr>
<tr>
<td>ENGL 401</td>
<td>First-Year Writing</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 403</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 411</td>
<td>Introductory Biology: Molecular and Cellular</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discovery Course</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>17</td>
</tr>
<tr>
<td>Spring</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 404</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 412</td>
<td>Introductory Biology: Evolution, Biodiversity and Ecology</td>
<td>4</td>
</tr>
<tr>
<td>MATH 424B</td>
<td>Calculus for Life Sciences</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>Discovery Course</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td></td>
<td>16</td>
</tr>
<tr>
<td>Second Year</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Fall</td>
<td></td>
<td></td>
</tr>
<tr>
<td>CHEM 547</td>
<td>Organic Chemistry I</td>
<td>5</td>
</tr>
<tr>
<td>&amp; CHEM 549</td>
<td>and Organic Chemistry Laboratory</td>
<td></td>
</tr>
<tr>
<td>BMS 503</td>
<td>General Microbiology</td>
<td>5</td>
</tr>
<tr>
<td>&amp; BMS 504</td>
<td>and General Microbiology Laboratory</td>
<td></td>
</tr>
<tr>
<td>BIOL 528</td>
<td>Applied Biostatistics I</td>
<td>4</td>
</tr>
</tbody>
</table>

Credits

- If course is used to fulfill BMCB Core or Laboratory Technique requirement, course cannot count as BMCB Major Elective.
- Choose no more than ONE of the following courses to fulfill a major elective: BMCB 795, BMCB 795W, BMCB 799, BMCB 799H.
PHYS 401  Introduction to Physics I  4

Credits  18

Spring
CHEM 548  Organic Chemistry II  5
& CHEM 550  and Organic Chemistry Laboratory
GEN 604  Principles of Genetics  4
PHYS 402  Introduction to Physics II  4
Discovery Course  4

Credits  17

Third Year
Fall
BMCB 605  Principles of Cell Biology  4
BMCB 751  Principles of Biochemistry  4
BMCB Core or Lab Techniques course  4-5
Discovery Course  4

Credits  16-17

Spring
BMCB 752  Principles of Biochemistry  4
BMCB Core or Lab Techniques course  4-5
Discovery Course  4
Elective (any course)  4

Credits  16-17

Fourth Year
Fall
BMCB Major Elective (possible Capstone)  4
Discovery Course  4
BMCB Major Elective (any course)  4
Elective (any course)  4

Credits  16

Spring
Elective (any course)  4-5
BMCB Major Elective  4
Elective (any course)  4

Credits  12-13

Total Credits  128-131

---

**Student Learning Outcomes**

**SLO: Core Knowledge in Biochemistry, Molecular Biology, and Cell Biology.**

- Students will be able to explain the structure and function of macromolecules, including key functional groups, higher order structure and function of macromolecules, catalysis and enzyme kinetics.
- Students will be able to explain matter and energy conversion, including thermodynamics, catalysis, biological energy, ATP and its function in metabolism.
- Students will be able to explain cellular homeostasis, including major metabolic pathways for carbohydrates, lipids, proteins and nucleic acids, key regulatory steps in these pathways and the organization of metabolic enzymes.

**SLO: Quantitative Literacy, Inquiry & Analysis**

- Students will be able to apply the scientific method to examine experimental evidence and draw informed conclusions.
- Students will be able to use graphs to represent scientific data.
- Students will be able to apply statistical methods to interpret scientific data.

**SLO: Critical Thinking & Problem Solving**

- Students will be able to use data to troubleshoot an unexpected outcome.
- Students will be able to apply core knowledge to critically interpret scientific data.

**SLO: Written Communication**

- Students will demonstrate written skills to communicate scientific knowledge and experimental data.

**SLO: Oral Communication**

- Students will be able to demonstrate oral presentation skills to communicate scientific knowledge and experimental data.