Molecular, Cellular and Developmental Biology - Bachelor of Arts (BA)

The undergraduate degree in molecular, cellular and developmental biology emphasizes knowledge and awareness of:

- the biological sciences in general and a detailed understanding of currently important aspects of cellular biology, molecular biology, biochemistry, genetics and developmental biology; and
- the relationship of the specialty area to broader areas of science and to society in general, including ethical issues raised by current biological research and by the rapid growth of biotechnology as an important shaping force for the future.

In addition, students completing the degree in molecular, cellular and developmental biology are expected to acquire the ability and skills to:

- learn detailed laboratory procedures rapidly when the need arises;
- demonstrate a scientific vocabulary and an understanding of research methods that permits the comprehension of current journal articles, extraction of pertinent information and judgment of the quality of the work described;
- evaluate a biological problem, determine which aspects are understood and apply basic research methods and techniques to the unknown aspects; and
- communicate scientific concepts and analytical arguments clearly and concisely, both orally and in writing.

Requirements

Prerequisites

It is MCDB policy to enforce the course prerequisites listed in the course catalog. If you have not either taken and passed (C- or better) the prerequisites for a course, or obtained permission from the instructor or a departmental advisor to take the course based on equivalent preparatory course work or experience here or elsewhere, you may be administratively dropped from the course.

Course Requirements

Students must complete the general requirements of the College of Arts and Sciences and the required courses listed below. All required courses must be completed with a grade of C- or better.

It is strongly recommended that MCDB majors consult with a departmental advisor before applying AP, IB or CLEP credit. Students majoring in MCDB who transfer biology credit from other institutions also must consult a departmental advisor.

Students who plan to double major with biochemistry or chemistry are encouraged to meet with an academic advisor to understand how their chemistry courses will apply to the MCDB major.

Students who plan to also pursue a degree in engineering are encouraged to meet with an academic advisor to understand how their chemistry and calculus courses will apply to the MCDB major.

Required Courses and Credit Hours

Required Courses

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Name</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCDB 1150</td>
<td>Introduction to Cellular and Molecular Biology (MCDB 1152 is a recommended coseminar for MCDB 1150)</td>
<td>3</td>
</tr>
<tr>
<td>MCDB 2150</td>
<td>Principles of Genetics (MCDB 2152 is a recommended coseminar for MCDB 2150)</td>
<td>3</td>
</tr>
<tr>
<td>MCDB 1151</td>
<td>From Dirt to DNA: Phage Genomics Laboratory I</td>
<td>2</td>
</tr>
<tr>
<td>MCDB 1171</td>
<td>Drug Discovery Through Hands-on Screens I</td>
<td></td>
</tr>
<tr>
<td>MCDB 2171</td>
<td>Drug Discovery Through Hands-On Screens 2</td>
<td></td>
</tr>
<tr>
<td>MCDB 3135</td>
<td>Molecular Cell Biology I</td>
<td>3</td>
</tr>
<tr>
<td>MCDB 3140</td>
<td>Cell Biology Laboratory</td>
<td>2</td>
</tr>
<tr>
<td>MCDB 3145</td>
<td>Molecular Cell Biology II</td>
<td>3</td>
</tr>
</tbody>
</table>

Upper division capstone and scientific reasoning requirements:

Select one of the following MCDB Capstone courses: 3

- MCDB 4650 Developmental Biology
- MCDB 4300 Immunology
- MCDB 4777 Molecular Neurobiology

Select one MCDB scientific reasoning course (see department for full list of approved courses): 3

- MCDB 4350 Microbial Diversity and the Biosphere
- MCDB 4361 Evolution and Development
- MCDB 4410 Human Molecular Genetics
- MCDB 4422 Molecular Biology of Free Radicals: Role(s) in Oxidative Stress, Signaling, Disease, Aging
- MCDB 4425 Topics in Membrane Biology: Cell Biology, Physiology and Disease
- MCDB 4426 Cell Signaling and Developmental Regulation
- MCDB 4427 Biology of the Visual System
- MCDB 4444 Cellular Basis of Disease
- MCDB 4471 Mechanisms of Gene Regulation in Eukaryotes
- MCDB 4550 Cells, Molecules and Tissues: A Biophysical Approach
- MCDB 4615 Biology of Stem Cells
- MCDB 4680 Mechanisms of Aging
- MCDB 4750 Animal Virology
- MCDB 4790 Experimental Embryology
- MCDB 4810 Insane in the Membrane: The Biology and Biophysics of the Membrane
- MCDB 4811 Teaching and Learning Biology

Electives

An additional 8 credit hours of MCDB upper-division electives (see department for approved courses) | 8

Required Ancillary Courses:

Complete the following chemistry courses: | 18-20

- CHEM 1113 General Chemistry 1
- & CHEM 1114 and Laboratory in General Chemistry 1
- CHEM 1133 General Chemistry 2
- & CHEM 1134 and Laboratory in General Chemistry 2
- CHEM 3311 Organic Chemistry 1
- & CHEM 3321 and Laboratory in Organic Chemistry 1
- CHEM 4611 Survey of Biochemistry

Select one of the following physics sequences: | 9-10

- PHYS 1110 General Physics 1
- & PHYS 1120 and General Physics 2 (including PHYS 1140 lab)
PHYS 2010  General Physics 1
& PHYS 2020  and General Physics 2

Select one of the following calculus or statistics courses: 3-5

Calculus:
- MATH 1300  Calculus 1
- MATH 1310  Calculus, Systems, and Modeling
- APPM 1350  Calculus 1 for Engineers

Statistics:
- MATH 2510  Introduction to Statistics
- EBIO 1010  Introduction to Quantitative Thinking for Biologists
- IPHY 2800  Introduction to Statistics
- PSYC 2111  Psychological Science I: Statistics

Total Credit Hours  60-65

1  EBIO 1210 is an acceptable alternative to MCDB 1150.
2  EBIO 2070 is accepted in place of MCDB 2150.
3  Up to 6 hours of MCDB 4840 Upper-Division Independent Study, MCDB 4980 Honors Research, MCDB 4990 Honors Thesis, or select courses from outside MCDB may be used. See department for details.
4  PHYS 2010 and 2020 are algebra based. PHYS 1110, 1120 and 1140 are calculus-based and require calculus 1 and 2.

Graduating in Four Years

Consult the Four-Year Guarantee Requirements for information on eligibility. The concept of "adequate progress" as it is used here only refers to maintaining eligibility for the four-year guarantee; it is not a requirement for the major. To maintain adequate progress in molecular, cellular and developmental biology, students should meet the following requirements:

- In the first semester, declare the MCDB major.*
- During the first and second semesters, complete either general chemistry or the introductory MCDB sequence.
- By the end of the fourth semester, complete general chemistry and the introductory MCDB sequence with a C- or better.
- By the end of the eighth semester, complete the major.

*If the major is not started in the first year, the student must meet with an MCDB academic advisor to ensure that it is still possible to complete the major in 4 years.