**MOLECULAR BIOLOGY (B.S.)**

The main objectives of our undergraduate Molecular Biology major are: to educate students in greater depth in molecular studies than would be possible in our Biology program, and to prepare students in the methodological advances which have changed the study of biology in recent years. The field of molecular biology has an impact on almost every other area of study in the biological sciences, and its development has led to expanded graduate and professional programs. The Molecular Biology curriculum will provide undergraduate students with a fundamental knowledge of the principles and practices inherent in the rapidly advancing field of molecular biology.

Students who major in Molecular Biology can also enter the burgeoning biotechnology industry, well prepared to compete in the modern scientific marketplace, as most institutions carry on basic or applied research in biomedical areas today using techniques of molecular biology. Students completing this major will be well-prepared to enter professional schools of medicine, dentistry, veterinary medicine, and optometry, as well as graduate programs.

Certain pre-qualified students may be accepted into the major; others will need to complete the following:

- 2.5 overall GPA required

Please note: The Biology, Molecular Biology, and Marine Biology and Coastal Science majors have retention policies. By the end of their second semester in the major (i.e. spring semester), students must maintain a minimum GPA of 2.5 and have completed the following courses with a C- or better grade: BIOL112 or BIOL113, and CHEM106 or CHEM120, and MATH111 or AMAT120.

Students are required to meet with their assigned advisor.

Contact: Dr. Dirk Vanderklein, Science Hall 107A, vanderkleid@montclair.edu.

**Program Requirements Overview**

Unless otherwise noted, 120 credits of coursework is required for the baccalaureate degree with a minimum 2.0 overall GPA, and a minimum 2.0 major GPA.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>General Education Requirements</strong></td>
<td>32</td>
</tr>
<tr>
<td></td>
<td><strong>World Languages and Cultures Requirements</strong></td>
<td>3-9</td>
</tr>
<tr>
<td></td>
<td><strong>Major Requirements</strong></td>
<td>79</td>
</tr>
<tr>
<td></td>
<td><strong>Free Electives</strong></td>
<td>6-0</td>
</tr>
<tr>
<td></td>
<td><strong>Total Credits</strong></td>
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</table>

**Major Requirements**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 112</td>
<td>Principles of Biology: Introduction to the Cell</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 113</td>
<td>Principles of Biology: Organisms and Diversity</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 230</td>
<td>Cell and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 350</td>
<td>Microbiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 380</td>
<td>Genetics</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 434</td>
<td>Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 435</td>
<td>Experimental Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 409</td>
<td>Externship in Biological Research (Co-operative Education)</td>
<td>4</td>
</tr>
<tr>
<td>or BIOL 418</td>
<td>Biology Independent Research</td>
<td>3</td>
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</table>

**Elective Courses**

Select 8 credits from the list below.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
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<tbody>
<tr>
<td>CHEM 120</td>
<td>General Chemistry I</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 121</td>
<td>General Chemistry II</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 230</td>
<td>Organic Chemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 231</td>
<td>Organic Chemistry II</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 232</td>
<td>Experimental Organic Chemistry I</td>
<td>2</td>
</tr>
<tr>
<td>CHEM 370</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
<tr>
<td>CHEM 371</td>
<td>Biochemistry II</td>
<td>3</td>
</tr>
</tbody>
</table>

**Chemistry Collateral**

Select one of the following sequences:

- PHYS 191 & PHYS 192 University Physics I and University Physics II
- PHYS 193 & PHYS 194 College Physics I and College Physics II

**Math Collateral**

Select two of the following options:

- STAT 230 & STAT 231 Data Science and Statistics and Data Science and Biostatistics
- AMAT 120 & MATH 12; Calculus I
- AMAT 220 & MATH 221 Calculus II

**Physics Collateral**

Select one of the following sequences:

- PHYS 191 & PHYS 192 University Physics I and University Physics II
- PHYS 193 & PHYS 194 College Physics I and College Physics II

**Computer Science Collaterals**

- CSIT 100 Introduction to Computer Concepts
- or CSIT 111 Fundamentals of Java Programming

**Total Credits** 79

**Electives**

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 360</td>
<td>Introduction to Bio-Imaging</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 405</td>
<td>Cell Culture</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 406</td>
<td>Scanning Electron Microscopy</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 410</td>
<td>Toxicology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 411</td>
<td>Introduction to Transmission Electron Microscopy</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 415</td>
<td>Population Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 425</td>
<td>Elementary Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 433</td>
<td>Developmental Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 442</td>
<td>Human Physiology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 443</td>
<td>Vertebrate Embryology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 444</td>
<td>Cell Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 445</td>
<td>Immunology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 446</td>
<td>Endocrinology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 447</td>
<td>Fundamentals of Pharmacology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 450</td>
<td>Medical Microbiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 451</td>
<td>Comparative Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 457</td>
<td>Virology</td>
<td>3</td>
</tr>
<tr>
<td>Code</td>
<td>Title</td>
<td>Credits</td>
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<tr>
<td>--------</td>
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</tr>
<tr>
<td>BIOL 458</td>
<td>Microbial Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 468</td>
<td>Neurobiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 475</td>
<td>Medical Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 476</td>
<td>Biology of Cancer</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 482</td>
<td>Research Community I: Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 483</td>
<td>Research Community II: Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIOL 487</td>
<td>Statistical Genomics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 488</td>
<td>Special Topics in Cell and Molecular Biology</td>
<td>3-4</td>
</tr>
<tr>
<td>BIOL 491</td>
<td>Research in Biology Literature</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 492</td>
<td>Senior Colloquium</td>
<td>1</td>
</tr>
<tr>
<td>BIOL 493</td>
<td>Molecular Ecology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 497</td>
<td>Genomics</td>
<td>3</td>
</tr>
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</table>

**General Education Requirements**

Click here for a list of courses that fulfill General Education categories. ([http://catalog.montclair.edu/programs/general-education-requirements-ba-bs/](http://catalog.montclair.edu/programs/general-education-requirements-ba-bs/))

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>A. New Student Seminar</strong></td>
<td></td>
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<tr>
<td></td>
<td>Complete a 1 credit New Student Seminar course.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>C. Communication</strong></td>
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</tr>
<tr>
<td></td>
<td>1. Writing</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2. Literature</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3. Communication</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>D. Fine and Performing Arts</strong></td>
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</tr>
<tr>
<td></td>
<td>Complete a 3 credit Fine and Performing Arts course.</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>F. Humanities</strong></td>
<td></td>
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<tr>
<td></td>
<td>1. Great Works and Their Influences</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2. Philosophical and Religious Perspectives</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>G. Computer Science</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fulfilled in the major.</td>
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<tr>
<td></td>
<td>CSIT 100 Introduction to Computer Concepts</td>
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</tr>
<tr>
<td></td>
<td>or CSIT 111 Fundamentals of Java Programming</td>
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</tr>
<tr>
<td></td>
<td><strong>H. Mathematics</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Fulfilled by mathematics collateral requirements in</td>
<td></td>
</tr>
<tr>
<td></td>
<td>the major.</td>
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<tr>
<td></td>
<td><strong>I. Natural Science Laboratory</strong></td>
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<tr>
<td></td>
<td>BIOL 112 Principles of Biology: Introduction to the</td>
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<td></td>
<td>Cell (Fulfilled in the major.)</td>
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<tr>
<td></td>
<td><strong>J. Physical Education</strong></td>
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<tr>
<td></td>
<td>Complete a 1 credit Physical Education course.</td>
<td>1</td>
</tr>
<tr>
<td></td>
<td><strong>K. Social Science</strong></td>
<td></td>
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<tr>
<td></td>
<td>1. American and European History</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>2. Global Cultural Perspectives</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td>3. Social Science Perspectives</td>
<td>3</td>
</tr>
<tr>
<td></td>
<td><strong>L. Interdisciplinary Studies</strong></td>
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<tr>
<td></td>
<td>Complete a 3 credit Interdisciplinary Studies course.</td>
<td>3</td>
</tr>
</tbody>
</table>

**World Languages and Cultures Requirements**

Click here for a list of courses that fulfill World Languages and Cultures categories. ([http://catalog.montclair.edu/programs/world-languages-and-cultures-requirements/](http://catalog.montclair.edu/programs/world-languages-and-cultures-requirements/))

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td><strong>World Languages</strong></td>
<td></td>
</tr>
<tr>
<td></td>
<td>Based on language placement exam, complete one or</td>
<td>3-6</td>
</tr>
<tr>
<td></td>
<td>two sequential courses in the same language.</td>
<td></td>
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<tr>
<td></td>
<td><strong>World Cultures</strong></td>
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</tr>
<tr>
<td></td>
<td>Requirement may be fulfilled by course selected in</td>
<td>0-3</td>
</tr>
<tr>
<td></td>
<td>General Education - Social Science: Global Cultural</td>
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</tr>
<tr>
<td></td>
<td>Perspectives. Requirement may also be fulfilled by</td>
<td></td>
</tr>
<tr>
<td></td>
<td>major coursework.</td>
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</tbody>
</table>

**Recommended Roadmap to Degree Completion**

This four-year plan is provided as an outline for students to follow in order to complete their degree requirements within four years. This plan is a recommendation and students should only use it in consultation with their academic advisor.

**First Year**

<table>
<thead>
<tr>
<th>Fall</th>
<th>Credits</th>
<th>Spring</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>GENERAL EDUCATION: (A) New Student Seminar</td>
<td>1</td>
<td>GENERAL EDUCATION: (C2) Literature</td>
<td>3</td>
</tr>
<tr>
<td>GENERAL EDUCATION: (C1) Writing, (C3) Communication</td>
<td>3</td>
<td></td>
<td>3</td>
</tr>
</tbody>
</table>

**Total Credits 10**