Biotechnology

Dr. Debra Mohler, Director
Phone: (540) 568-8803
Location: Physics Chemistry Building Room 1124

Mission
In cooperation with the Department of Integrated Science and Technology and the Department of Chemistry and Biochemistry, the Department of Biology offers a four-year, cross disciplinary B.S. degree program for a major in biotechnology. Students majoring in biotechnology will be prepared to either enter the biotechnology workforce or pursue graduate education in a wide array of fields including medical, agricultural or industrial biotechnology. Fields of research in biotechnology include applied molecular biology, bioinformatics and genomics.

Biotechnology majors must complete 47-53 credit hours of science foundation courses, 17 credit hours of biotechnology transition and core courses, and 15 credit hours of elective courses. Students may not receive dual credit toward the biotechnology major for 300- and 400-level biology courses that are applied toward the biology major. Biotechnology majors are not eligible for the biochemistry and molecular biology minor.

Major and Degree Requirements
Bachelor of Science in Biotechnology

Degree Requirements Credit Hours
General Education 1 41
Quantitative requirement 2 3
Scientific Literacy requirement 2 3-4
Major requirements (listed below) and electives 79

1 The General Education program contains a set of requirements each student must fulfill. The number of credit hours necessary to fulfill these requirements may vary.
2 In addition to General Education.

Major Requirements

Science Foundation Courses Credit Hours
BIO 114. Organisms 4
BIO 124. Ecology and Evolution 4
BIO 214. Cell and Molecular Biology 4
BIO 224. Genetics and Development 4
CHEM 131-132. General Chemistry I-II 6
CHEM 241-242. Organic Chemistry Lecture I-II 6
CHEM 242L. Organic Chemistry Laboratory 2
PHYS 140/140L-150/150L 8

Choose one of the following sets of courses:
MATH 231. Calculus with Functions I 4
MATH 232. Calculus with Functions II or MATH 235 Calculus I 4

Choose one of the following courses:
MATH 220. Elementary Statistics 3
MATH 285. Data Analysis 4

Biotechnology Transition and Core Courses Credit Hours
BIOT 260. Biotechnology Seminar 1
ISAT 305. Biotechnology Lab 1
ISAT 451. Biotechnology in Industry and Agriculture 3
ISAT 456. Ethical, Legal and Social Implications of Biotechnology 3
CHEM 361. Biochemistry I 3
CHEM 368L. Biochemistry Lab 2
BIO 480. Advanced Molecular Biology 4

Biotechnology Elective Courses Credit Hours
Select 15 credit hours from the following list:
BIO 316. Principles of Animal Development 4
BIO/MATH 342. Mathematical Models in Biology 3
BIO 364. Human Uses of Plants 3
BIO 365. Laboratory in Human Uses of Plants 1
BIO 370. Animal Physiology 4
BIO 380. General Microbiology 4
BIO 416. Human Embryology 4
BIO 420. Medical Parasitology 3
BIO 421. Medical Parasitology Lab 1
BIO 430. Human Genetics 3
BIO 442. Immunology 3
BIO 443. Immunology Laboratory 1
BIO 444. Virology 3
BIO 445. Neurobiology 4
BIO 448. Medical Microbiology 4
BIO 450. Evolutionary and Societal Impacts of Developmental Biology 3
BIO 454. Introduction to Biometrics 4
BIO 455. Plant Physiology 4
BIO 465. Environmental Toxicology 4
BIO 466. Toxicology Seminar 3
BIO 472. Human Metabolism 3
BIO 475. Advanced Cell Biology 3
BIO 481. Genomics 4
BIO 482. Human Histology 4
BIO 490. Biomechanics 4
CHEM 331. Physical Chemistry I 3
CHEM 338L. Applied Physical Chemistry Laboratory 1
CHEM 351. Analytical Chemistry 4
CHEM 352. Instrumental Analysis 3
CHEM 352L. Instrumental Analysis Laboratory 2
CHEM 362. Biochemistry II 3
CHEM 370. Inorganic Chemistry I 3
CHEM 440. Intermediate Organic Chemistry 3
CHEM 445. Polymer Chemistry 4
ISAT 450. Biotechnology and the Environment 3
ISAT 452. Medical Biotechnology 3
ISAT 454. Computer Applications in Biotechnology 3
ISAT 455. Regulatory Issues in Biotechnology 3
ISAT 457. Business of Biotechnology 3
ISAT 459. Awareness and Understanding of Chemical, Biological and Radiological Weapons of Mass Destruction 3

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MATH 318. Introduction to Probability and Statistics 4  
MATH 321. Analysis of Variance and Experimental Design 3  
MATH 322. Applied Linear Regression 3  
MATH 421. Applied Multivariate Statistical Analysis 3  
Other 300- and 400-level courses may meet the requirement but permission must be sought from the biotechnology program director.  

Students are highly encouraged to include academic credit for research, up to 8 credits of which may be applied to the concentration requirement.  

**Recommended Schedule for Majors**  
First semester, first year biotechnology majors are encouraged to start with a 14-15 hour course load. This will generally include a biology course (four credit hours), CHEM 131 and CHEM 131L, and/or a math course, plus General Education. The work load will then be increased in the second semester based on the level of success during the first semester.  

<table>
<thead>
<tr>
<th>First Year</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>BIO 114. Organisms 1</td>
<td>4</td>
</tr>
<tr>
<td>BIO 124. Ecology and Evolution</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 131 and CHEM 131L. General Chemistry I 1</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 132 and CHEM 132L. General Chemistry II</td>
<td>4</td>
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<tr>
<td>Quantitative course 1</td>
<td>4-8</td>
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<tr>
<td>General Education: Cluster One</td>
<td>9</td>
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<tr>
<td><strong>Total</strong></td>
<td><strong>25-33</strong></td>
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1. Fulfills General Education: Cluster Three.  

<table>
<thead>
<tr>
<th>Second Year</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>BIOT 260. Biotechnology Seminar</td>
<td>1</td>
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<tr>
<td>ISAT 305. Biotechnology Lab</td>
<td>1</td>
</tr>
<tr>
<td>BIO 214. Cell and Molecular Biology</td>
<td>4</td>
</tr>
<tr>
<td>BIO 224. Genetics and Development</td>
<td>4</td>
</tr>
<tr>
<td>CHEM 242L. Organic Chemistry Laboratory</td>
<td>2</td>
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<tr>
<td>Quantitative course</td>
<td>3-4</td>
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<tr>
<td>General Education: from Clusters Two, Four and Five</td>
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<tr>
<td><strong>Total</strong></td>
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<tr>
<th>Third Year</th>
<th>Credit Hours</th>
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<tbody>
<tr>
<td>CHEM/BIO 361 and CHEM 366L. Biochemistry Lab</td>
<td>5</td>
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<tr>
<td>BIO 480. Advanced Molecular Biology</td>
<td>4</td>
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<tr>
<td>Biotechnology Electives</td>
<td>4</td>
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<tr>
<td>Physics courses</td>
<td>8</td>
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<tr>
<td>General Education: from Clusters Two, Four and Five</td>
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</tr>
<tr>
<td>Electives</td>
<td>4</td>
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<tr>
<td><strong>Total</strong></td>
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<thead>
<tr>
<th>Fourth Year</th>
<th>Credit Hours</th>
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</thead>
<tbody>
<tr>
<td>ISAT 456. Social and Ethical Issues</td>
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<tr>
<td>ISAT 451. Biotechnology in Industry</td>
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<tr>
<td>Biotechnology Electives</td>
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<tr>
<td>General Education: from Clusters Two, Four and Five</td>
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<tr>
<td>Electives</td>
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<tr>
<td><strong>Total</strong></td>
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