Biotechnology M.S.

The graduate plan in Biotechnology leads to the Master of Science (M.S.) degree. This innovative and interdisciplinary MS program offers an industry focus on a comprehensive exploration of basic science, applied science, and lab science. The biotechnology graduate program at UHCL provides a solid foundation in biochemistry, molecular biology, cell biology, genomics and proteomics. The student’s course of study qualifies them for careers in research and development, teaching, or private industry. Students must specialize in one of the following areas:

- Molecular Biotechnology
- Bioinformatics/ Computational Biology
- Biotechnology Management

The GRE is optional. The suggested GRE score (verbal + quantitative) should be a minimum of 290 points, with a minimum quantitative score of 150, verbal score of 140 and writing score of 3.5. Required GPA should be 3.0 or higher.

Students need to submit transcripts of past college and university experience. Students who do not submit and/or do not meet College GRE and/or GPA standards will be required to meet additional performance criteria by submitting 3 letters of recommendation, resume and a personal statement detailing future work and research plans.

Successful applicants should have completed the basic requirements for the Bachelor of Science degree in Biological Sciences or a related filed or have completed the following courses (including prerequisites or equivalents) before applying for admission:

Requirements

### Basic Requirements

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOL 3341</td>
<td>Molecular Genetics</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 4341</td>
<td>Biochemistry I</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 4344</td>
<td>Comparative Animal Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 4345</td>
<td>Human Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 4343</td>
<td>Plant Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 4347</td>
<td>Cellular Physiology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 4351</td>
<td>Molecular Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5011</td>
<td>Methods of Biotechnology Discussions</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 5021</td>
<td>Methods of Biotechnology</td>
<td>2</td>
</tr>
<tr>
<td>STAT 3308</td>
<td>Computational Statistics</td>
<td></td>
</tr>
</tbody>
</table>

**Additional Information**

- Students must select from BIOL 4344 Or BIOL 4345 Or BIOL 4343.
- In all cases for basic requirements, evidence of completion of the course with a grade of C or better is required.
- Students must be registered concurrently for both the lab and discussion course BIOT 5021/BIOT 5011.
- Students missing some basic requirements may be admitted to the program on the condition that such courses will need to be taken at UHCL within the first 18 hours.

### Core Requirements (30 hours)

The M.S. degree requires the completion of 30 hours. All core requirements and Biotechnology electives must be completed with a grade of "C" or better and a GPA of ≥ 3.0 must be maintained. All graduate students in the Biotechnology program must complete a Candidate Plan of Study (CPS) with their assigned faculty adviser before they complete 9 hours of graduate credit.
Courses completed past the initial 9 hours that are not on the approved CPS may not be counted toward the degree.

Although the M.S. in Biotechnology does not require independent study, co-op (internship), field experience (practicum), or thesis, these options are available and students are highly encouraged to participate in these courses and experiences.

In addition to the following required courses there are additional required courses for each specialization: Refer to Biotechnology Program Specialization Areas and Electives sections.

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT 5031</td>
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<tr>
<td></td>
</tr>
<tr>
<td>BIOT 5733</td>
</tr>
<tr>
<td></td>
</tr>
<tr>
<td>BIOT 5736</td>
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</tbody>
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Biotechnology Extended Coursework Option

Under the extended coursework option, a minimum of 27 hours of coursework in one of the three Specialization areas, of which 18-24 hours (depending on the specialization) must be biotechnology (BIOT) courses and three hours of BIOT 6838 Research Project and Seminar taken in the last 12 hours. Non-thesis students who complete BIOT 5530 as an elective will still be required to complete BIOT 6838.

Biotechnology Thesis Option

The Thesis Option requires a minimum of 21 hours of Biotechnology (BIOT) courses in one of the three Specialization Areas, BIOT 5530 Research Methods in Biotechnology, and six hours of BIOT 6939 Master’s Thesis Option. Graduate students who are pursuing the master’s thesis option are advised to consult with their faculty adviser early in their studies for guidance in preparation for beginning the thesis and register for BIOT 5530 Research Methods in Biotechnology early in their studies.

If they take more than 6 hours of BIOT 6939, they are not able to count them toward their degree and they will only receive a grade for 6 hours. Once they enroll in the course, they have to stay continually enrolled until they graduate. Any hours above the 6 will show a credit only with no grade.

Biotechnology Program Specialization Areas and Electives

Specialization Prerequisites

Please be informed that there are additional prerequisites for each specialization/concentration. In all cases for specialization requirements, evidence of completion of the course with a grade of C or better is required.

Molecular Biotechnology Specialization

The M.S. in Biotechnology with a Specialization in Molecular Biotechnology requires 30 hours of coursework, of which 24 hours must be biotechnology (BIOT).

<table>
<thead>
<tr>
<th>Required Courses</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT 5111</td>
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<tr>
<td></td>
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<tr>
<td>BIOT 5112</td>
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<tr>
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</tbody>
</table>
Additional Information

- Students must complete Methods of Biotechnology laboratory and discussion sections BIOT 5021/BIOT 5011 before registering for laboratory and discussion sections BIOT 5121/BIOT 5111 and BIOT 5122/BIOT 5112.
- Students must be registered concurrently for both the laboratory and discussion courses (BIOT 5021/BIOT 5011, BIOT 5121/BIOT 5111, and BIOT 5122/BIOT 5112).

### Molecular Biotechnology Specialization Electives (3-9 hours)

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT 5231</td>
<td>Advanced Mammalian Tissue Culture</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5235</td>
<td>Bacterial Taxonomy and Biotechnology Laboratory</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5331</td>
<td>Stem Cell Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5431</td>
<td>Genomic Analysis</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5433</td>
<td>Marine Biotechnology Seminar</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5535</td>
<td>Environmental Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5833</td>
<td>Proteomics</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5915</td>
<td>Cooperative Education Work Term</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 5921</td>
<td>Laboratory Topics in Biotechnology</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 5931</td>
<td>Research Topics in Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 5939</td>
<td>Independent Study in Biotechnology</td>
<td>3</td>
</tr>
<tr>
<td>BIOT 6011</td>
<td>Biotechnology Practicum</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 6021</td>
<td>Biotechnology Practicum</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 6031</td>
<td>Biotechnology Practicum</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 5131</td>
<td>Membrane Biology</td>
<td>3</td>
</tr>
<tr>
<td>BIOL 5132</td>
<td>Cell Signaling</td>
<td></td>
</tr>
</tbody>
</table>

### Specialization Prerequisites

Although laboratory courses in Molecular Biology and Biochemistry will greatly assist students, these skills will be reviewed and enhanced in Methods of Biotechnology laboratory and discussion sessions BIOT 5021/BIOT 5011, therefore none are required.

### Bioinformatics/Computational Biology Specialization

The M.S. in Biotechnology with a Specialization in Bioinformatics/Computational Biology requires 30 hours of coursework, of which 18 hours must be in biotechnology (BIOT).

Additional prerequisites for the Bioinformatics/Computational Biology Specialization (UHCL course or equivalent) are:

<table>
<thead>
<tr>
<th>Course</th>
<th>Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>CSCI 1320</td>
<td>C Programming</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 1470</td>
<td>Computer Science I</td>
<td>4</td>
</tr>
<tr>
<td>CSCI 1370</td>
<td>Software Development with Java</td>
<td>3</td>
</tr>
<tr>
<td>CSCI 1471</td>
<td>Computer Science II</td>
<td>4</td>
</tr>
</tbody>
</table>
CSCI 2315  Data Structures  Credit Hours: 3
CSCI 4333  Design of Database Systems  Credit Hours: 3

Additional Information
- Students must complete CSCI 1320 or CSCI 1470, and CSCI 1370 or CSCI 1471, and CSCI 2315 in the listed order as each one is a pre-requisite for the following course.
- In all cases for specialization requirements, evidence of completion of the course with a grade of "C" or better is required.

Required Courses
CSCI 5833  Data Mining: Tools and Techniques
CSCI 5933  Computational Bioinformatics

Additional Information
CSCI 5833 must be taken prior to CSCI 5933.

Bioinformatics/Computational Specialization Electives (3-9 hours)

BIOT 5111  Advanced Methods of Biotechnology I
Discussions  Credit Hours: 1
BIOT 5112  Advanced Methods of Biotechnology II
Discussions  Credit Hours: 1
BIOT 5121  Advanced Methods of Biotechnology I
Credit Hours: 2
BIOT 5122  Advanced Methods of Biotechnology II
Credit Hours: 2
BIOT 5235  Bacterial Taxonomy and Biotechnology Laboratory
Credit Hours: 3
BIOT 5431  Genomic Analysis
Credit Hours: 3
BIOT 5915  Cooperative Education Work Term
Credit Hours: 1
BIOT 5919  Independent Study in Biotechnology
Credit Hours: 1
BIOT 5921  Laboratory Topics in Biotechnology
Credit Hours: 2
BIOT 5931  Research Topics in Biotechnology
Credit Hours: 3
BIOT 5939  Independent Study in Biotechnology
Credit Hours: 3
BIOT 6011  Biotechnology Practicum
Credit Hours: 1

BIOT 6031  Biotechnology Practicum
Credit Hours: 3
CSCI 4333  Design of Database Systems  Credit Hours: 3
CSCI 5530  Pattern Classification
CSCI 5532  Pattern Recognition and Image Processing
CSCI 5633  Web Database Development

Biotechnology Management Specialization
The M.S. in Biotechnology with a Specialization in Management requires 30 hours of coursework, of which 18 hours must be in biotechnology (BIOT). Additional prerequisites for the Biotechnology Management specialization (UHCL course or equivalent) are:

Specialization Prerequisites
UHCL course or equivalent.

MGMT 3301  Management Theory and Practice
Credit Hours: 3
MGMT 4354  Organizational Behavior Theory and Application
Credit Hours: 3

Additional Information
- If students have not taken MGMT 3301 and MGMT 4354, they may take MGMT 5032 to fulfill the foundation requirements of this specialization.
- In all cases for specialization requirements, evidence of completion of the course with a grade of C or better is required.

Required Courses
BIOT 5111  Advanced Methods of Biotechnology I
Discussions  Credit Hours: 1
BIOT 5112  Advanced Methods of Biotechnology II
Discussions  Credit Hours: 1
BIOT 5121  Advanced Methods of Biotechnology I
Credit Hours: 2
BIOT 5122  Advanced Methods of Biotechnology II
Credit Hours: 2
BIOT 5915  Cooperative Education Work Term
Credit Hours: 1
BIOT 5919  Independent Study in Biotechnology
Credit Hours: 1
BIOT 5921  Laboratory Topics in Biotechnology
Credit Hours: 2
BIOT 5931  Research Topics in Biotechnology
Credit Hours: 3
BIOT 5939  Independent Study in Biotechnology
Credit Hours: 3
BIOT 6011  Biotechnology Practicum
Credit Hours: 1
EMGT 5430  Professional Project Management  Credit Hours: 3

Additional Information
- Students select BIOT 5111/5121 Or BIOT 5112/5122.
- Students must complete Methods of Biotechnology laboratory and discussion sections BIOT 5011/5021 before registering for laboratory and discussions sections BIOT 5111/5121 and/or BIOT 5112/5122.

Designated Electives
Students are required to take 3 of the following electives:

- MGMT 5032  Human Behavior in Organizations  Credit Hours: 3
- MGMT 5133  Teamwork and Leadership Skills: Theory in Practice  Credit Hours: 3
- MGMT 5434  Negotiation Skills and Strategies  Credit Hours: 3
- MGMT 5636  Management of Technology  Credit Hours: 3
- MGMT 5638  Leading Technology  Credit Hours: 3

Biotechnology Management Specialization Electives (3-9 hours)

- BIOT 5111  Advanced Methods of Biotechnology I Discussions  Credit Hours: 1
- BIOT 5112  Advanced Methods of Biotechnology II Discussions  Credit Hours: 1
- BIOT 5121  Advanced Methods of Biotechnology I  Credit Hours: 2
- BIOT 5122  Advanced Methods of Biotechnology II  Credit Hours: 2
- BIOT 5915  Cooperative Education Work Term  Credit Hours: 1
- BIOT 5919  Independent Study in Biotechnology  Credit Hours: 1
- BIOT 5921  Laboratory Topics in Biotechnology  Credit Hours: 2
- BIOT 5929  Independent Study in Biotechnology  Credit Hours: 2
- BIOT 5931  Research Topics in Biotechnology  Credit Hours: 3
- BIOT 5939  Independent Study in Biotechnology  Credit Hours: 3