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 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. As a condition of admittance to the graduate program, students who do not meet School GRE and/or GPA standards will be required to meet additional performance criteria, such as past performance in critical courses, withdrawal and drop history, letters of recommendation, personal knowledge of past performance, improvement on repeated courses, and/or work experience and individual faculty support as a mentor in the research laboratory.

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.
- A maximum of six credit hours of the 4000-level courses listed above may be applied toward the M.S. degree.

### Core Requirements (36 hours)

The M.S. degree requires the completion of 36 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

For more information, visit www.uhcl.edu/catalog.
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>
<th>BIOT 5031</th>
<th>Applied Biotechnology Credit Hours: 3</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT 5733</td>
<td>Bioinformatics Credit Hours: 3</td>
<td></td>
</tr>
<tr>
<td>BIOT 5736</td>
<td>Bioethics Credit Hours: 3</td>
<td></td>
</tr>
</tbody>
</table>

Biotechnology Extended Coursework Option

Under the extended coursework option, a minimum of 33 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 27 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 36 hours of coursework, of which 24 hours must be biotechnology (BIOT).

<table>
<thead>
<tr>
<th>Required Courses</th>
<th>BIOT 5111 Advanced Methods of Biotechnology I Discussions Credit Hours: 1</th>
</tr>
</thead>
</table>

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

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 (9-15 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 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>
</tbody>
</table>

BIOL 5132  Cell Signaling  Credit Hours: 3

BIOL 5332  Toxicology  Credit Hours: 3

BIOL 5433  Enzymology  Credit Hours: 3

BIOL 5435  Advanced Immunology  Credit Hours: 3

BIOL 5634  Apoptosis

BIOL 5635  Neuroscience

BIOL 5732  Advances in Molecular Biology  Credit Hours: 3

BIOL 5734  Oncogenes  Credit Hours: 3

BIOL 5738  Gene Therapy  Credit Hours: 3

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 36 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:

Specialization Prerequisites

<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></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

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 (9-15 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 36 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
- MKTG 3301 | Principles of Marketing  
Credit Hours: 3

Additional Information
- If students have not taken MGMT 3301, MGMT 4354, and MKTG 3301, they may take MGMT 5032 and MKTG 5031 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 5211 | Advanced Methods of Biotechnology I  
Credit Hours: 2
- BIOT 5212 | 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
- BIOT 5211 | Advanced Methods of Biotechnology I  
Credit Hours: 2
- BIOT 5212 | Advanced Methods of Biotechnology II  
Credit Hours: 2
**EMGT 5430**  
Professional Project Management  
Credit Hours: 3

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

### Designated Electives

Students are required to take 3 of the following electives:

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>MGMT 5032</td>
<td>Human Behavior in Organizations</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 5133</td>
<td>Teamwork and Leadership Skills: Theory in Practice</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 5434</td>
<td>Negotiation Skills and Strategies</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 5636</td>
<td>Management of Technology</td>
<td>3</td>
</tr>
<tr>
<td>MGMT 5638</td>
<td>Leading Technology</td>
<td>3</td>
</tr>
</tbody>
</table>

### Biotechnology Management Specialization Electives (9-15 hours)

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<tr>
<td>BIOT 5111</td>
<td>Advanced Methods of Biotechnology I Discussions</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 5112</td>
<td>Advanced Methods of Biotechnology II Discussions</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 5121</td>
<td>Advanced Methods of Biotechnology I</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 5122</td>
<td>Advanced Methods of Biotechnology II</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 5915</td>
<td>Cooperative Education Work Term</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 5919</td>
<td>Independent Study in Biotechnology</td>
<td>1</td>
</tr>
<tr>
<td>BIOT 5921</td>
<td>Laboratory Topics in Biotechnology</td>
<td>2</td>
</tr>
<tr>
<td>BIOT 5929</td>
<td>Independent Study 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>
</tbody>
</table>

### Additional Information
- Students enrolled in the Management specialization cannot take more than 15 hours of Management.

<table>
<thead>
<tr>
<th>Course Code</th>
<th>Course Title</th>
<th>Credit Hours</th>
</tr>
</thead>
<tbody>
<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>MGMT 6332</td>
<td>International Management</td>
<td>3</td>
</tr>
</tbody>
</table>