The Master of Biotechnology degree program is designed to give students broad knowledge and training in the scientific and practical aspects of biotechnology. It involves innovative, hands-on, and multidisciplinary learning approaches to educate and train students in the science behind biotechnology, its business and legal aspects, and the ethical and social issues that it brings about. In addition, the courses and the activities required of all students in this program develop transferable professional skills such as team-working and communication skills, which are very important in industry in particular.

Graduates of this program are expected to have the knowledge and training for diverse career options: as academic educators, as scientists in both academic and industry settings, as members of decision-making business and management teams in government and biotechnology industries, as bioentrepreneurs, and as members and leaders of governmental, public, and private organizations that deal with social, ethical and legal issues in biotechnology. Because of their broad knowledge in biotechnology, graduates of this program are expected to fill a niche in industry where knowledge and ability to interphase and communicate with various functional groups within the organization are required.

Admission Requirements
Applicants apply for admission to the program via the Graduate School application for admission (http://gradschool.psu.edu/prospective-students/how-to-apply). Requirements listed here are in addition to Graduate Council policies listed under GCAC-300 Admissions (http://gradschool.psu.edu/graduate-education-policies).

The program is appropriate for students with a baccalaureate degree in biological sciences, chemistry, or engineering or other baccalaureate degrees that include sufficient credits from relevant courses in the life sciences. Applicants must have a minimum junior/senior grade point average of 3.00 (on a 4.00 scale). Graduate Record Examinations (GRE) scores are required for verbal, quantitative, and analytical writing. Typically, students are admitted as part of a cohort to commence studies in the Fall. The best-qualified applicants will be accepted up to the number of spaces available for new students.

Degree Requirements
Master of Biotechnology
Requirements listed here are in addition to Graduate Council policies listed under GCAC-700 Professional Degree Requirements (http://gradschool.psu.edu/graduate-education-policies).

A minimum of 30 credits at the 400, 500, or 800 level is required for completion of the degree, 18 credits of which must be from courses in the 500 or 800 level, with a minimum of 6 credits at the 500 level. Students are required to take 16 to 18 credits from core courses listed below. Additional credits are from industry internship or cooperative education (co-op) and elective courses. A list of approved elective courses is maintained by the graduate program office. All Master of Biotechnology candidates are required to write a research paper based on a research project conducted in an academic, government, or industry research laboratory as the culminating experience for the degree. The research paper is completed while the student is enrolled in MCIBS 594.

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>BMB 400</td>
<td>Molecular Biology of the Gene</td>
<td>3</td>
</tr>
<tr>
<td>BIOTC 479 or BE 468</td>
<td>Methods in Biofermentations Microbiological Engineering</td>
<td>3</td>
</tr>
<tr>
<td>MCIBS 571</td>
<td>Current Issues in Biotechnology</td>
<td>2</td>
</tr>
<tr>
<td>MCIBS 590</td>
<td>Colloquium</td>
<td>2</td>
</tr>
<tr>
<td>MCIBS 591</td>
<td>Ethics in the Life Sciences</td>
<td>1</td>
</tr>
<tr>
<td>MCIBS 593</td>
<td>Molecular Biology Laboratory</td>
<td>3</td>
</tr>
</tbody>
</table>

Electives 1

<table>
<thead>
<tr>
<th>Code</th>
<th>Title</th>
<th>Credits</th>
</tr>
</thead>
<tbody>
<tr>
<td>MCIBS 594</td>
<td>Research Topics</td>
<td>3-6</td>
</tr>
</tbody>
</table>

1 These courses are chosen from offerings in various academic departments based on student's interest or track and career objectives. These also include MCIBS 595 (Internship) and any 596 (Individual Studies) course under a faculty member whose research relates to a student’s area of interest. A list of approved elective courses is maintained by the graduate program office.

Integrated Undergrad-Grad Programs
Integrated B.S. in Biotechnology and M.BIOT. in Biotechnology
Requirements listed here are in addition to requirements listed in GCAC-210 Integrated Undergraduate-Graduate (IUG) Degree Programs (http://gradschool.psu.edu/graduate-education-policies/gcac/gcac-200/gcac-210-integrated-undergraduate-graduate-degree-programs).

The integrated B.S. in Biotechnology-Master of Biotechnology degree program is designed to enable qualified undergraduate students in the B.S. Biotechnology program to graduate in five years with the Master of Biotechnology degree.

Admission Requirements
Students must apply to the program via the Graduate School application for admission (http://www.gradschool.psu.edu/prospective-students/how-to-apply), and must meet all the admission requirements of the Graduate School and the Biotechnology graduate program for the Master of Biotechnology degree, listed on the Admission Requirements tab. Students shall be admitted to an IUG program no earlier than the beginning of the third semester of undergraduate study at Penn State.
Courses

Graduate courses carry numbers from 500 to 699 and 800 to 899. Advanced undergraduate courses numbered between 400 and 499 may be used to meet some graduate degree requirements when taken by graduate students. Courses below the 400 level may not. A graduate student may register for or audit these courses in order to make up deficiencies or to fill in gaps in previous education but not to meet requirements for an advanced degree.

Molecular, Cellular, and Integrative Biosciences (MCIBS) Course List (https://bulletins.psu.edu/university-course-descriptions/graduate/mcibs)

Learning Outcomes

1. KNOW. Students will be able to demonstrate conceptual and practical knowledge of the broad aspects of biotechnology: the core areas in science and the technologies that drive progress in biotechnology, the business, intellectual property, regulatory, legal, social and ethical aspects of the biotechnology industry; students will also be able to show practical understanding of the professional skills vital to employment and career success in biotechnology.

2. APPLY/CREATE/THINK. Students will be able to demonstrate critical review of scientific literature, proficiency in the conduct of scientific research independently or in a team setting, as well as in non-bench research-related responsibilities in broad areas of biotechnology as necessary. Students will also demonstrate adequate professional preparation for competitive curricular employment (internships and cooperative education or co-op) and entry-level employment post-degree.

3. COMMUNICATE. Students will demonstrate skills in communicating scientifically through group work, research papers and oral presentations, and professionally through networking, interviews, resumes or curriculum vitae (CVs), and other required career-related activities.

4. PROFESSIONAL PRACTICE. Students will demonstrate knowledge of interpersonal workplace dynamics, the ability to perform in a team environment and adapt to a very dynamic biotechnology workplace, participation in professional networking, and engagement in professional activities and organizations serving the discipline and the industry.

Contact

Campus
University Park
Loida J Escote-Carlson
Terrie Louise Young
Huck Institutes of the Life Sciences
101 Life Sciences Building
University Park PA 16802
tly2@psu.edu
(814) 863-3273

Program Contact

Program Web site
View (https://www.huck.psu.edu/graduate-programs/master-of-biotechnology)