

APPLIED BIOTECHNOLOGY (MS)

Department website (<https://www.uwp.edu/learn/programs/biotechnologymms.cfm>)

The M.S. in Applied Biotechnology represents a fully online, asynchronous curriculum comprised of 31 credits to include six core courses, three sets of track courses, a Capstone preparation course, and a project-based Capstone course. This program is offered collaboratively with UW-Green Bay, UW-Madison, UW-Oshkosh, UW-Parkside, UW-Platteville, UW-Stevens Point, and UW-Whitewater with administrative and financial support from UW-Extended Campus.

Goals of the Program

Graduates of the program will gain the core competencies required to manage functions across a wide range of biotechnology industries. The required capstone course, which represents the culminating experience in the program, will provide students with the opportunity to apply skills acquired from coursework through a project-based experience in their 'track'.

Student Learning Outcomes

Graduates will:

Competency A – Demonstrate professional and scientific communication appropriate for biotechnology settings.

Upon completion of the program, students will be able to:

- Select the most appropriate modalities, methodologies, tools, and practices to communicate complex ideas effectively across diverse audiences
- Demonstrate effective listening, written, verbal, and nonverbal communication skills
- Construct and deliver effective professional presentations

Competency B – Demonstrate comprehensive understanding of organizational processes and product development pipelines.

Upon completion of the program, students will be able to:

- Evaluate and describe systems of product research, development, and production
- Analyze the potential for commercialization for innovations within the biotechnology industry
- Critique and integrate changes to an existing product development pipeline
- Compare organizational processes employed by biotech firms

Competency C - Distinguish among diverse methods and technologies and their applications in biotechnology.

Upon completion of the program, students will be able to:

- Compare and contrast emerging with existing technologies
- Exhibit strong technical knowledge to evaluate and choose appropriate technologies

- Demonstrate the ability to read, interpret and apply scientific literature
- Demonstrate competency in data analyses and statistics

Competency D – Demonstrate strategic leadership and decision-making skills necessary in biotechnology.

Upon completion of the program, students will be able to:

- Compare best practices in leadership required for executive action
- Demonstrate the skills and processes that maximize team performance to successfully meet goals both as an effective team member and leader
- Identify and provide evidence-based solutions to problems in compliance, development, personnel, and finance

Competency E – Appraise the current regulatory, quality control, and legal frameworks that impact biotechnology.

Upon completion of the program, students will be able to:

- Demonstrate understanding of relevant domestic and global regulatory agencies, laws, policies and guidances
- Assess intellectual property considerations in biotechnology
- Justify the importance of quality and risk management in biotechnology and explain current good practices

Competency F – Demonstrate professional and ethical behaviors that foster positive and productive interactions in diverse biotechnology settings.

Upon completion of the program, students will be able to:

- Recognize, foster and apply principles of ethical and professional conduct
- Identify professional opportunities and personal success by acquiring knowledge, networking, and other career development strategies
- Understand cultural differences that exist in the global marketplace

Requirements for the Master of Applied Biotechnology

| Code | Title | Credits |
|--|--|---------|
| Required Courses | | |
| ABT 700 | Principles of Biotechnology | 3 |
| ABT 705 | Ethics, Safety and Regulatory Environment in Biotechnology | 3 |
| ABT 710 | Professional and Technical Communication in Biotechnology | 3 |
| ABT 715 | Techniques in Biotechnology | 3 |
| ABT 720 | Experimental Design and Analysis in Biotechnology | 3 |
| ABT 725 | Leadership in Organizations | 3 |
| Elective Options | | |
| Complete nine credits from one of the following options: | | 9 |
| Quality Assurance and Compliance | | |
| Business Management | | |
| Research and Development | | |
| Required Capstone Courses | | |
| ABT 789 | Pre-Capstone | 1 |

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|----------------------|----------|-----------|
| ABT 790 | Capstone | 3 |
| Total Credits | | 31 |

Elective Options

Quality Assurance and Compliance

| Code | Title | Credits |
|----------------------|---|----------|
| ABT 735 | Quality Control and Validation | 3 |
| ABT 740 | Regulatory Practice and Compliance | 3 |
| ABT 745 | Industrial Applications in Regulatory Affairs | 3 |
| Total Credits | | 9 |

Business Management

| Code | Title | Credits |
|----------------------|---|----------|
| ABT 750 | Biotechnology Marketing and Entrepreneurship | 3 |
| ABT 755 | Global Operations and Supply Chain Management | 3 |
| ABT 760 | Quality and Project Management | 3 |
| Total Credits | | 9 |

Research and Development

| Code | Title | Credits |
|----------------------|---------------------------------------|----------|
| ABT 765 | Assessing Innovation in Biotechnology | 3 |
| ABT 770 | Product Development | 3 |
| ABT 775 | Tools for Data Analysis | 3 |
| Total Credits | | 9 |

University Requirements for Master's Degree Programs

To receive a master's degree from UW-Parkside, students must meet the following minimum requirements (note that individual programs may impose more stringent requirements):

1. Complete at least 30 graduate credits, of which no more than 12 may be transferred from another institution.
2. Have an overall GPA of at least 3.00 for all graduate work taken at UW-Parkside that is applicable to the degree program.
3. Satisfy all requirements of the graduate degree program.

Students may take no more than seven years to complete a degree, beginning with the semester in which they complete their first course as a UW-Parkside degree-seeking graduate student, unless they apply for and receive an extension through the appropriate graduate program. Some programs may impose a shorter time limit. To graduate, students must file a request for graduation. The request form, signed by the student's advisor and filed in the appropriate graduate program office, initiates the final review of the candidate's records. Students also need to apply to graduate with the Office of the Registrar.

Admission to the master of science in applied biotechnology program requires:

- Bachelor's degree from a regionally or nationally accredited university (in any discipline).
- 3.00/4.00 GPA. Students with a GPA less than a 3.0 may be considered for a provisional admission. The Academic Director has the discretion to waive a prerequisite that will allow a student to take an ABT course. Please contact the Academic Director, Dr. Francis Mann, for more information.

- Prerequisite coursework of two semesters of college level biology and/or chemistry with laboratory.
- Employment résumé.
- Three letters of recommendation.
- A personal statement of not more than 1000 words describing your reasons for pursuing a master of science in applied biotechnology, your short- and long-term career goals, and what value you would add to the learning experience of your fellow students. Space for the personal statement is included in the online application.

Courses in Applied Biotechnology

ABT 700 | Principles of Biotechnology | 3 cr

Introduction to basic principles and techniques pertaining to biotechnology and its applications to our society. Survey of classical and emerging techniques.

Prerequisites: None.

Offered: Fall, Spring, Summer.

ABT 705 | Ethics, Safety and Regulatory Environment in Biotechnology | 3 cr

Ethical and safety concerns in development, production, funding, and application of biotechnology. Analysis of socioeconomic impacts. Understanding the importance of data integrity. Overview of risk assessment and management in a regulatory environment designed to ensure safety of workers, study subjects, and patients, and protect intellectual property, data, and the environment.

Prerequisites: None.

Offered: Fall, Spring, Summer.

ABT 710 | Professional and Technical Communication in Biotechnology | 3 cr

Application and analysis of professional scientific communication, both written and oral. Focuses on designing documents that convey complex, data-rich technical and scientific content to audiences with diverse information needs using a variety of professional genres, including reports, proposals, presentation, and documentation.

Prerequisites: None.

Offered: Fall, Spring, Summer.

ABT 715 | Techniques in Biotechnology | 3 cr

Application of biological and chemical methods to modern biotechnological product development. Overview of analysis techniques used to characterize products and evaluate quality and safety. Exploration of technological pipeline from conception to market, including proof-of-concept assessment, pre-clinical trials, clinical trials and post-production testing.

Prerequisites: ABT 700.

Offered: Fall, Spring, Summer.

ABT 720 | Experimental Design and Analysis in Biotechnology | 3 cr

Principles of descriptive and inferential statistics with applications in biotechnology including experimental design, quantitative data analysis, and bioinformatic evaluation of complex molecular and biological data sets.

Prerequisites: Admission to the Applied Biotechnology graduate degree program or admission to the Applied Bioinformatics certificate.

Offered: Fall, Spring, Summer.

ABT 725 | Leadership in Organizations | 3 cr

Focuses on strategies and tools that managers use to maximize employee contribution and create organizational excellence. Basic business and leadership principles. Best practices to overcome biases that inhibit organizations and teams from communicating effectively. Examples will come from diverse biotechnology fields, including pharmaceuticals, agriculture, and biotechnology services.

Prerequisites: None.

Offered: Fall, Spring, Summer.

ABT 730 | Python for Bioinformatics | 3 cr

Introduces diverse strategies for computational analysis of macromolecular data using Python including sequence alignment, genome annotation, data retrieval from databases, phylogenetic analysis, and molecular evolution. Experiential learning is emphasized; confidence in practical skills is developed through persistent application of course content to projects focused on current problems in bioinformatic research.

Prerequisites: Admission to the applied bioinformatics certificate.

Offered: Fall, Spring, Summer.

ABT 735 | Quality Control and Validation | 3 cr

Focuses on the importance of quality control and validation in biotechnology product design, development, and manufacturing. Explores quality systems and documentation, global quality standards, and methods for assessing validation including installation, operational, and performance qualifications. Overviews bio-manufacturing processes, automation, and cGMP/cGLP practices necessary to meet quality standards.

Prerequisites: ABT 700, ABT 705, ABT 710.

Offered: Yearly.

ABT 740 | Regulatory Practice and Compliance | 3 cr

Identifies and examines the key regulatory agencies and practices that govern the highly regulated and diverse biotechnology industry, both domestically and internationally. Highlights current and emerging FDA and ICH regulations and guidance documents to successfully navigate meeting with agencies and to submit required documentation for successful product development.

Prerequisites: ABT 700, ABT 705, ABT 710.

Offered: Yearly.

ABT 745 | Industrial Applications in Regulatory Affairs | 3 cr

Examines the global regulatory environments in risk-based assessment of biotechnological developments across diverse sectors, ensuring consumer and environmental protection. Addresses how validation is essential to the incorporation of emerging technologies into viable, accessible, and successful products. Highlights the stakeholders' role in regulatory oversight and policy through relevant industry case studies.

Prerequisites: ABT 700, ABT 705, ABT 710.

Offered: Yearly.

ABT 750 | Biotechnology Marketing and Entrepreneurship | 3 cr

Examines marketing case studies in diverse areas of biotechnology. Addresses marketing fundamentals and strategies, communicating value proposition strategy, ethical and regulatory concerns, startup strategies, pharmaceutical marketing, b2b marketing, salesforce development, branding, and promotion. Culminates with the creation of a marketing plan/analysis.

Prerequisites: None.

Offered: Yearly.

ABT 755 | Global Operations and Supply Chain Management | 3 cr

Focuses on the strategic importance of the supply chain to overall performance relevant to a variety of business processes specific to biotechnology. Topics include life cycle analysis, corporate social responsibility, production, transportation, distribution systems, sourcing, and purchasing.

Prerequisites: None.

Offered: Yearly.

ABT 760 | Quality and Project Management | 3 cr

Quality and project management issues and roles during different phases from R&D to market. Introduction to installation qualification, operation qualification and process qualification (IQ/OQ/PQ). Project management phases: conceptualizing, planning, executing and closing. Project schedule and time management tools and techniques. Project requirements including quality assurance.

Prerequisites: ABT 720, ABT 725.

Offered: Yearly.

ABT 765 | Assessing Innovation in Biotechnology | 3 cr

A survey of biotechnology assessments in areas such as regenerative medicine, agricultural biotechnology, and bioremediation. Course links disciplines with the critical evaluative role played by scientific discovery, market valuation, intellectual property, freedom-to-operate (FTO), and licensing strategy by assessing the role each played in the commercialization of a specific technology.

Prerequisites: ABT 700.

Offered: Yearly.

ABT 770 | Product Development | 3 cr

Explores strategies in evaluation and implementing new technologies or products in the context of different bioindustries. Identifies considerations in product valuation, feasibility of production, scalability, and supply chain management. Models the process of business growth and innovation through integration of emerging technologies.

Prerequisites: ABT 700, ABT 715.

Offered: Yearly.

ABT 775 | Tools for Data Analysis | 3 cr

Using a variety of existing and emerging bioinformatics tools and computational methods, emphasizes hands-on experiences analyzing and interpreting large data sets (e.g. genomic, proteomic, microbiomics, target discovery). Students will also evaluate and adapt existing computational approaches for specific use in solving a problem in biotechnology.

Prerequisites: ABT 705, ABT 715.

Offered: Yearly.

ABT 780 | Bioinformatics Inquiry | 3 cr

Advances the development of competencies promoting efficient analysis of biological data. Emphasizes matching a research problem with the most effective tools for its completion, balancing use of existing software and de novo software development. Advanced aspects of Python and R, algorithmics, machine learning, simulations, and effective communication of results are emphasized.

Prerequisites: ABT 720, ABT 730; admission to the applied bioinformatics certificate.

Offered: Fall, Spring, Summer.

ABT 785 | Applications of Bioinformatics | 3 cr

Exploration and application of existing bioinformatic tools.

Implementation of pre-coded solutions to data acquisition, wrangling, analysis, visualization, and structural modeling problems. Students will complete a project that generates a multi-system workflow to solve bioinformatic problems.

Prerequisites: ABT 720, ABT 730; admission to the applied bioinformatics certificate.

Offered: Fall, Spring, Summer.

ABT 789 | Pre-Capstone | 1 cr

Prepares opportunity for applied self-directed capstone experience.

Addresses problem identification, research, and project formulation.

Culminates in an oral and written proposal with project schedule.

Prerequisites: Completion of all core courses and at least one track course; additional track courses may be taken concurrently.

Offered: Fall, Spring, Summer.

ABT 790 | Capstone | 3 cr

Students will complete a project (report, business plan, program, etc.) in an area of quality assurance and compliance, business and management, and/or research and development. Culminating in a substantive body of work, executive summary, and reflection. Networking and communication in a professional capacity is expected.

Prerequisites: ABT 789.

Offered: Fall, Spring, Summer.