

# Biotechnology Laboratory Technician

Program Number: 10-007-2

## Associate in Applied Science Degree

Biotechnology &amp; Electron Microscopy Program Cluster

Center for Agriscience and Technologies

Courses offered at Truax Campus

For information call: (608) 246-6204, (608) 243-4307 or  
(800) 322-6282 Ext. 6204 or 4307

### About the Program

The Biotechnology Laboratory Technician Program emphasizes skills necessary for entry-level employment in bioscience laboratories. The program focuses on techniques basic to the commercial development of products from biological systems. Students acquire proficiency in laboratory skills, effective communications and employment skills. Individuals who like the challenge of laboratory work are encouraged to apply.

Program graduates may seek entry-level employment in public or private laboratories for positions titled laboratory assistant, laboratory technician, laboratory tester or laboratory worker. These laboratories are found in universities, pharmaceutical companies, food processing industries, companies performing research and development, and companies involved in plant and animal breeding.

Check the Madison College Website or with the center office for the following certificates also available: Bioinformatics Certificate, Biotechnology Post-baccalaureate Certificate, and Biotechnology Intensive Post-baccalaureate Certificate.

### Unique Requirements for Admission

Admission requires competence in basic mathematics, science and English usage. Suggested coursework for high school students includes algebra, biology and chemistry. Students who enter without high school chemistry and algebra will be required to take equivalent courses at Madison College. Competency will be assessed with a COMPASS test (required), transcripts and/or personal interviews.

Students must receive a grade of C or higher in all program courses and all science courses.

### For more information:

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## Curriculum

The courses listed below outline the requirements for graduation for students entering this program in the 2011-2012 academic year. Requirements for graduation may vary depending on the semester in which a student is admitted to their program. Current/continuing students should consult their degree progress report available through their student center account for specific graduation requirements. Program requirements are subject to change.

FIRST YEAR		Hrs/week	
First Semester		Credits	Lec-Lab
10-007-103	Biotechnology Laboratory Skills for a Regulated Workplace .....	3	1-6
10-007-108	Hazardous Materials (6 weeks) .....	1	2-2
10-007-109	Biosafety (6 weeks) .....	1	2-2
10-007-102	Radioisotopes (6 weeks) .....	1	2-2
10-007-110	Biotechnology Applications .....	1	1-0
10-007-115	General Cell Biology .....	4	3-3
10-007-136	Laboratory Math for Biotechnology .....	1	0-2
10-806-127	Chemistry 1* OR .....	4	3-2
20-806-201	General, Organic, and Biological Chemistry* .....	(5)	(4-2)
<b>Semester Total</b>		<b>16</b>	

### Second Semester

10-007-104	Chromatography Techniques .....	3	1-6
10-007-105	Bioprocess Technology .....	3	1-6
10-007-111	Biotechnology Career Seminar .....	1	1-0
10-801-195	Written Communication* OR .....	3	3-0
20-801-201	English Composition 1* .....	(3)	(3-0)
10-806-129	Chemistry 2* OR .....	4	3-2
20-806-216	Chemistry for Biotechnology* .....	(3)	(2-2)
10-007-174	Applied Microbiology .....	4	2-4
<b>Semester Total</b>		<b>18</b>	

## SECOND YEAR

### First Semester

10-007-122	Protein Bioseparation Methods .....	3	1-6
10-007-123	Cell Culturing .....	3	1-6
10-007-124	Molecular Biology 1 .....	3	1-6
10-801-196	Oral/Interpersonal Communications* OR .....	3	3-0
20-801-202	English Composition 2* .....	(3)	(3-0)
10-809-197	Contemporary American Society* OR .....	3	3-0
20-809-203	Introduction to Sociology* .....	(3)	(3-0)
10-809-199	Psychology of Human Relations* OR .....	3	3-0
20-809-231	Introduction to Psychology* .....	(3)	(3-0)
<b>Semester Total</b>		<b>18</b>	

### Second Semester

10-007-112	Biotechnology Employment Skills .....	1	1-0
10-007-121	Applied Biochemistry .....	3	2-3
10-007-125	Research Methods in Molecular Biology .....	3	1-6
10-007-126	Occupational Work Experience .....	3	0-12
10-809-195	Economics* OR .....	3	3-0
20-809-211	Macroeconomics .....	(3)	(3-0)
	Elective .....	3	(3-0)
<b>Semester Total</b>		<b>16</b>	

\*Students may meet some or all of the general studies requirements at Madison College or at another college prior to entering the Biotechnology Program. Students are encouraged to take college transfer courses for educational advancement

Students are assessed for correct placement in English or mathematics courses based on their scores on the COMPASS test or on completion of the appropriate prerequisite(s). Additionally, there may be courses in other subject areas that may use COMPASS scores as prerequisites when reading, writing, math, or critical thinking competencies are required.



## Program Courses

**10-007-102 Radioisotopes** 1 credit  
Surveys potential hazards and safety procedures associated with radioisotopes. Lab exercises include liquid scintillation counting and autoradiography. Co-requisite: 10-806-127 or 20-806-201.

**10-007-103 Biotechnology Laboratory Skills for a Regulated Workplace** 3 credits  
Covers basic concepts and techniques necessary to work effectively in a biotechnology lab. The importance of quality regulations and standards and the role of the technician in producing quality results is emphasized. Laboratory math is introduced and applied. Students learn basic techniques including: measuring, weighing, mixing solutions, following and writing procedures, keeping records, making observations, and using instrument manuals and catalogues. Principles of metrology (measurement) are introduced and students practice using, calibrating, and verifying the performance of instruments. Lab included. Co-requisite: 10-806-127 or 20-806-201, and 10-007-136, or consent of instructor.

**10-007-104 Chromatography Techniques** 3 credits  
Introduces the basic concepts involved in separation of biomolecules. Students complete lab work using a variety of chromatographic methods including: paper, thin layer, gel permeation, gas and high performance liquid chromatography. Students also learn to interpret chromatographic results and practice documentation and reporting skills. Lab included. Prerequisites: 10-007-103, 10-007-136 and 10-806-127 or 20-806-201.

**10-007-105 Bioprocess Technology** 3 credits  
Covers basic techniques of fermentation technology, including the principles of isolation, identification, improvement, preservation and growth of industrial microorganisms. Emphasizes the use of fermentation equipment to obtain products. Lab included. Co-requisite: 10-806-127 or 20-806-201, or consent of instructor.

**10-007-108 Hazardous Materials** 1 credit  
Surveys potential laboratory hazards and safety procedures. Covers regulation of chemicals: flammable, reactive, corrosive, and toxic substances. Lab included. Co-requisite: 10-806-127 or 20-806-201.

**10-007-109 Biosafety** 1 credit  
Surveys potential hazards and safety procedures associated with biohazards including lab animals and pathogens. Lab included. Co-requisite: 10-806-127 or 20-806-201.

**10-007-110 Biotechnology Applications** 1 credit  
Provides a broad introduction to biotechnology including the scientific basis of the technologies and their historical development with an emphasis on current applications in the areas of agriculture, medicine, forensics and the environment.

**10-007-111 Biotechnology Career Seminar** 1 credit  
Includes a discussion of national, state and local biotechnology industries, career options, the ethical, legal and societal issues raised by the use of biotechnology and the regulatory agencies that oversee the industry.

**10-007-112 Biotechnology Employment Skills** 1 credit  
Discusses the specific skills needed for particular areas and careers, ethical issues and the business of biotechnology including the basics of intellectual property law. Each student gives a presentation on their occupational work experience. Co-requisite: 10-007-136.

**10-007-115 General Cell Biology** 4 credits  
Introduction to cells, emphasizing their structure, diversity, chemistry and physiology. Processes of cellular respiration, photosynthesis and division are discussed. Describes genetic principles and molecular activities involved in DNA, RNA and protein synthesis. Lab included.

**10-007-121 Applied Biochemistry** 3 credits  
Introduction to major chemical constituents of cells including proteins, carbohydrates, lipids and nucleic acids. The structure and kinetics of enzymes, reaction mechanisms, and metabolic pathways are also included. Lab included. Prerequisites: 10-007-103, 10-007-115 and 10-806-129 or 20-806-216 or consent of instructor.

**10-007-122 Protein Bioseparations Methods** 3 credits  
Introduces the general strategies commonly used to purify proteins. Specific methods include determining specific activities for enzymes, extraction of proteins from bacterial cells, salting out, dialysis, ion exchange chromatography and polyacrylamide gel electrophoresis. Lab included. Prerequisites: 10-007-103, 10-007-104 and 10-806-129 or 20-806-216 or consent of instructor.

**10-007-123 Cell Culturing** 3 credits  
Covers the basic techniques of plant and animal cell culture. Plant unit includes media preparation isolation of explants and establishment of callus from suspension cultures, growth factor bioassays, regeneration of whole plants from tissue and plant genetic engineering techniques. Mammalian cell unit includes media preparation, maintenance of cultured cells, including human embryonic stem cell lines, transfection of cultured cells, cloning, monoclonal antibody production, and ELISA assays. Lab included. Prerequisite: 10-007-103 and 10-007-115, or consent of instructor.

**10-007-124 Molecular Biology 1** 3 credits  
Introduces modern molecular biology techniques including basic recombinant DNA techniques and nucleic acid analysis and purification. The polymerase chain reaction, DNA sequence analysis, and DNA fingerprinting are also covered. Lab included. Prerequisite: 10-007-113 and 10-007-115, or consent of instructor.

**10-007-125 Research Methods in Molecular Biology** 3 credits  
Surveys advanced techniques in molecular biology including Southern analysis, and RNA purification and analysis. The course blends discussion of concepts with practical laboratory experience. Lab included. Prerequisite: 10-007-124 or consent of instructor.

**10-007-126 Occupational Work Experience** 3 credits  
Students work in a biotechnology laboratory. Emphasizes the integration of academics and practical experiences. Prerequisites: Successful completion of all program courses in the first three semesters of the program, or consent of instructor and successful completion of a performance exam. Co-requisite: 10-007-112.

**10-007-136 Laboratory Math for Biotechnology** 1 credit  
Course introduces mathematical tools that are used in the biotechnology laboratory. Students apply mathematical concepts to solve problems such as: calculating amounts of chemicals required to make solutions, graphing and interpreting data, and calibrating instruments. Basic statistical concepts may also be introduced. Prerequisite: satisfactory COMPASS Math Placement Test score.

**10-007-174 Applied Microbiology** 4 credits  
This survey course includes the structure, function, ecology, nutrition, physiology, and genetics of microorganisms in industrial, agricultural, food and medical microbiology. It also includes an introduction to standard techniques and procedures used in the microbiology laboratory. Prerequisite: 10-007-115.

## Career Potential:

- **Biotechnology Research Technicians**  
Complete scientific work in academic research laboratories, government research laboratories and biotechnology companies under direct supervision.
- **Biotechnology Production Technicians**  
Produce useful products using biological systems including bacterial and yeast cells, plants and animals.
- **Laboratory Technicians**  
Complete scientific work and conduct experiments in research and development or production laboratories in various biological and biochemical companies and private or public agencies.
- **Quality Control/Assurance Technicians**  
Check product performance/ characteristics to ensure regulatory compliance and minimize liability using physical, chemical and biological test equipment and instrumentation to ensure that the product is within acceptable tolerance.

With additional education and/or work experience, graduates may find employment as:

- **Research Scientists**
- **Entry Level Scientists**
- **Associate Scientists**
- **Process Scientists**

*More detailed and updated information on this program may be available at: [madisoncollege.org](http://madisoncollege.org). The college reserves the right to make changes in the regulations and courses announced in this publication without notice.*

*Madison Area Technical College provides equal opportunity in education and employment.*