

Biotechnology Post-baccalaureate "Traditional" Certificate

Certificate Number: 90-007-1

Certificate

Biotechnology & Electron Microscopy Program Cluster

School of Agriscience and Technologies

Courses offered at Madison Campus

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About the Certificate

The certificate curriculum includes courses from the Biotechnology Lab Technician program. The curriculum may be completed in two semesters or longer. Students completing this certificate will have the laboratory skills and knowledge needed for entry-level employment in biotechnology laboratories in both the public and private sector. Students are required to meet with the program director for advising and course scheduling plans. This certificate is perfect for individuals who have a theoretical bioscience background but need biotechnology laboratory skills in order to improve employment prospects.

Unique Requirements for Admission

Prerequisites: 1) a bachelor's degree in a biological science and consent of program director; 2) two semesters of college chemistry; 3) one semester of microbiology with laboratory component (strongly recommended); 4) two semesters of general biology and 5) a cell biology or genetics course within the last seven years. Applicants with missing prerequisites may complete those courses at Madison College.

Certificate Application Process

To apply, see: Apply Online (on the Madison College website). [Create an ApplyWeb account](#) and follow the [instructions](#) to complete the [Online Certificate Application](#) before the [application deadline](#). Submit the \$15 non-refundable fee (payable by credit card, debit card or electronic check) with your application. Applicants may submit more than one certificate application per term using the Online Certificate Application; the same fees apply for each additional application.

Unique Requirements for Completion

The certificate will be awarded upon completion of the requirements with a minimum of a 2.0 grade average and no course grade lower than a C. The certificate will be awarded when completion of all requirements is verified after the semester the last course has been completed.

Curriculum

In their first semester, all traditional post-baccalaureate participants must take *10-007-103 Biotechnology Laboratory Skills for a Regulated Workplace* (3 credits)

Courses	Hrs/week	
	Credits	Lec-Lab
10-007-103 <i>Biotech Lab Skills for a Regulated Workplace</i>	3	1-6
	3	

In addition, participants choose a minimum of 12 additional credits from the following list:

Courses	Hrs/week	
	Credits	Lec-Lab
10-007-105 Bioprocess Technology	3	1-6
10-007-104 Chromatography Techniques	3	1-6
10-007-124 Molecular Biology 1	3	1-6
10-007-122 Protein Bioseparation Methods	3	1-6
10-007-123 Cell Culturing	3	1-6
10-007-174 Applied Microbiology	4	2-4
10-007-180 Intro to Bioinformatics	3	2-2
10-007-155 Quality Regulations and Standards for Biotechnology ...	2	1-2
10-102-134 Business Organization and Management	2	2-0
10-007-125 Research Methods in Molecular Biology*	3	1-6
10-007-116 Introduction to Human Stem Cell Methods (Lecture).....	1	1-0
10-107-118 Introduction to Human Stem Cell Concepts (Lab).....	3	0-6
10-107-117 Advanced Human Stem Cell Methods (Lecture).....	1	1-0
10-107-119 <i>Advanced Human Stem Cell Concepts (Lab)</i>	3	0-6
	12	
Certificate Total	15	

*Requires 10-007-124 Molecular Biology, as a prerequisite.



Certificate Courses

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 are 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. Team-based projects simulate the application of these methods in a biotechnology research and development environment.

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.

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.

10-007-116 Introduction to Human Stem Cell Methods 3 credits

Covers the basic methods of working with mammalian cell culture, to include aseptic techniques, media preparation, passaging and maintenance of cell lines. Students will work with hESC cultures to thaw, plate, feed, passage cells, and generate embryoid bodies. Molecular characterization includes chromosomal staining and immunodetection and imaging of cell pluripotency markers. Instruction will include imaging, including light, fluorescence, and photomicroscopy. Using cultured cells in a regulated environment will be introduced. Prerequisite: 10-007-115 and 10-007-123; Co-requisite: 10-007-118, or consent of instructor.

10-007-117 Advanced Human Stem Cell Methods 3 credits

Students will continue to maintain and characterize the hESC embryoid bodies generated in Course I. Observations and relevance for spontaneous hESC differentiation will be discussed in detail. Methods for directed differentiation of hESC, iPSC, and adult stem cells into neurons and cardiomyocytes will be introduced. An emphasis on photo-documentation and assembly of a portfolio of results and observations will be submitted for evaluation. Prerequisite: 10-007-116.

10-007-118 Introduction to Human Stem Cell Concepts 1 credit

Provides a historical perspective on the identification and use of stem cells, emphasizing practical applications towards regenerative biology in research and industry. Review and discuss scientific articles that establish the foundation for working with stem cells for regenerative medicine, applied and basic research. Prerequisite: 10-007-115, or consent of instructor.

10-007-119 Advanced Human Stem Cell Concepts 1 credit

Introduction of emerging methodologies in the stem cell field, to include adult stem cells, iPSC technologies, relevant cell signaling pathways, and cell differentiation. Current research and industry applications will be discussed. Survey the scientific and popular press to introduce emerging themes and applications in the field of stem cells. Prerequisite: 10-007-115 and 10-007-118, or consent of instructor.

10-007-122 Protein Bioseparations Methods 3 credits

Introduces the strategies to purify proteins as part of a biotechnology process. Methods include: specific activity assays for enzymes, extraction of proteins from bacterial cells, salting out, dialysis, ion exchange chromatography and polyacrylamide gel electrophoresis.

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, transfection of cultured cells, cloning, monoclonal antibody production, and ELISA assays.

10-007-124 Molecular Biology I 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.

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.

10-007-155 Quality Regulations and Standards 2 credits

Introduction to federal and local regulations that control biotechnology, pharmaceutical, and medical device companies. Includes cGMP, GLP, GCP, ISO 9000, and QSR. No lab.

10-007-174 Applied Microbiology 4 credits

Surveys the structure, function, ecology, nutrition, physiology, and genetics of microorganisms in industrial, agricultural, food and medical microbiology. Class also includes an introduction to standard techniques and procedures used in the microbiology laboratory.

10-007-180 Introduction to Bioinformatics 3 credits

Overview of computer-based methods of analyzing genetic and biological information. Includes sequence comparisons, data mining, computing tools, and using Perl for biological applications.

10-102-134 Business Organization and Management 2 credits

This survey course imparts an understanding of the economic and legal environment in which businesses operate, as well as an understanding of the organization and management of business enterprises. An emphasis is placed on business terminology and concepts. No lab.

Career Potential:

- Research Scientists
- Entry Level Scientists
- Associate Scientists
- Process Scientists
- Laboratory Manager
- Quality Assurance
- Laboratory Supervisor
- Team Leader

More detailed and updated information on this program may be available at: 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.

Note: Lab included unless otherwise noted.