

BIOLOGY

The Biological Science degree at Mount Wachusett Community College provides students with the opportunity to earn an Associate's In Science Degree in Biology. Upon completion of the program, students are prepared for the rigors of a four-year institution to complete a baccalaureate degree. The Biological Science degree offers a student the opportunity to explore biology, while completing a core curriculum. Students will gain knowledge in a variety of disciplines including math, science, the humanities and social science.

BIOLOGY (BIO)

This program is designed to prepare students to transfer in the biological sciences with an A.S. degree and Mass Transfer benefits.

It will give the students the first two years of a typical biology program so that they are well-prepared for transfer. It may also be used as a pre-professional program for aspiring physicians, veterinarians, dentists and pharmacists. Since many of the classes are two-semester sequential courses, it is recommended that students start this program in the fall.

Year 1

		Credits
Fall		
BIO 109	Biology I	4
CHE 107	General Chemistry I	4
ENG 101	College Writing I	3
MAT 162	Introduction to Functions Modeling (Formerly MAT 134) (or higher) ¹	4
Spring		
MAT 163	Pre-Calculus (or higher)	4
ENG 102	College Writing II	3
CHE 108	General Chemistry II	4
BIO 110	Biology II	4

Year 2

Fall		
CHE 207	Organic Chemistry I	4
PSY 105	Introduction To Psychology	3
Professional Elective (see list below) ^{2,3}		4
Humanities Elective ⁴		3
Spring		
CHE 208	Organic Chemistry II	4
Professional Elective (see list below) ^{2,3}		4
Social Science Elective ⁵		3
Humanities Elective ⁴		3
BIO 210	Genetics	4
Total Credits:		62

¹ May take MAT 162 or higher.

² Students are strongly encouraged to meet with their advisor before registering for a professional elective.

³ Students interested in biotechnology should take BIO 205 Microbiology and BIO 215 Cell Biology for Professional Electives.

⁴ Humanities Electives: See Elective Courses by Abbreviation (<http://catalog.mwcc.edu/electivecoursesbyabbreviation/>).

⁵ Social Science Electives: See Elective Courses by Abbreviation (<http://catalog.mwcc.edu/electivecoursesbyabbreviation/>).

PROFESSIONAL ELECTIVES

		Credits
MAT 211	Calculus I	4
PHY 105	College Physics I	4
PHY 120	Physics for Engineering and Science I	4
BIO 205	Microbiology	4
BIO 215	Cell Biology (formerly BIO 170)	4
BIO 116	Ecology	4

BIO 122	Zoology: The Biology Of Animals	4
MAT 143	Statistics	3
BIO 130	Plant Science	4
BTC 101	Introduction To Biotechnology I	4

See Biology student learning outcomes and technical standards

Campus

This program is offered on the Gardner campus only.

Transfer Options

For transfer options, please click here (<http://catalog.mwcc.edu/academicresources/#transferinformationtext>). It is recommended that you also consult with your academic advisor.

MASSTRANSFER

Students who plan to transfer to a Massachusetts state university or a University of Massachusetts campus may be eligible to transfer under the MassTransfer agreement, which provides transfer advantages to those who qualify.

Please click here for MassTransfer information (<http://www.mass.edu/masstransfer/>)

PROGRAM STUDENT LEARNING OUTCOMES FOR BIO

Upon completion of the Associates in Science in Biology, students will be able to:

1. Transfer to four-year programs.
2. Illustrate an understanding of biological systems and evolutionary processes spanning all ranges of biological complexity, including atoms, molecules, genes, cells and organisms.
3. Demonstrate both written and oral communication skills using scientific terminology.
4. Carry out laboratory protocols while using appropriate laboratory equipment.
5. Work in collaboration with other students in a scientific environment.
6. Apply mathematical concepts to solving quantitative scientific problems.

TECHNICAL STANDARDS FOR BIO ¹

Students entering this program must be able to demonstrate the ability to:

- Comprehend textbook material at a college level.
- Communicate and assimilate information either in spoken, printed, signed, or computer voice format.
- Gather, analyze, and draw conclusions from data.
- Stand for a minimum of two hours.
- Differentiate by touch: hotness/coldness, wetness/dryness, and hardness/softness.
- Use the small muscle dexterity necessary to do such tasks as gloving, gowning, and operating controls on laboratory instrumentation.
- Respond promptly to spoken words, as well as monitor signals and instrument alarms.
- Identify behaviors that would endanger a person's life or safety and intervene quickly in a crisis situation with an appropriate solution.
- Remain calm, rational, decisive, and in control at all times, especially during emergency situations.
- Manipulate small parts, and make fine hand adjustments to machines and test equipment.
- Operate a computer.

¹ For general information about technical standards and accommodation, see Technical Standards. (<http://catalog.mwcc.edu/academicresources/academicandgradingpolicies/technicalstandards/>)

BIO 101. Introduction To Nutrition (formerly NUT101). 3 Credits.

This course introduces the broad aspects of nutrition as it applies to human existence. Included in the topical analysis are items related to digestion, essential nutrients, energy balance, vitamins, water, fitness, and weight control, as well as a discussion of changing needs of individuals as they age or become ill. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement.

BIO 102. Introduction To Forestry. 4 Credits.

This course provides a general introduction to the practice and profession of forestry. This course will not result in becoming a forester but will equip participants with the tools to understand forest ecology and forest management decisions. This course will allow you to communicate with foresters and understand forests' complexity, their values, and the factors influencing forest stewardship. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Fall.

BIO 103. Human Health And Disease. 3 Credits.

This lecture-based course describes the basic structure and function of most organ systems within the context of some common human diseases. Homeostasis, the dynamic equilibrium in which the internal environment of an organism is maintained fairly constant, is the theme of this course that allows the understanding of certain common diseases. Students with little science background will investigate human disease within a personal context. Prerequisites: ENG 098, FYE 101, RDG 098, MAT 092 or placement.

BIO 104. Introduction To Natural Resource Conservation. 4 Credits.

This is an introductory course in natural resource conservation that will provide comprehensive overview of local, regional, and global resource and environmental issues. Topics will include population growth, soil conservation and agriculture, aquatic environments, air and water pollution, forest and wildlife management, global climate change, and energy usage. Strategic thinking towards sustainability will be a unifying theme in exploring the natural resources we depend upon in our complex, interconnected global environment. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Fall.

BIO 105. Current Topics in Biological Science. 3 Credits.

This course will give the student an exposure to, and understanding of, contemporary issues in biological science. Topics may change each semester. Representative topics to be explored might include antibiotics, antibiotic resistance, and vaccination, genetic engineering, climate change and its impact on food, water and disease, bioterrorism, overpopulation, and nutritional supplements. Topics will be explored through a variety of avenues, including discussion, readings, videos, and student research. Prerequisites: ENG 098, MAT 092 (or co-requisite), RDG 098, or placement.

BIO 109. Biology I. 4 Credits.

Biology, as a science, represents a way of interacting with the world in a rational manner. The nature of science, cellular structure and function, the molecules of life, the acquisition and use of energy by living organisms, the code of heredity, principles of genetics, and genetic recombination will be considered in this course. Lab sessions will be hands on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement.

BIO 110. Biology II. 4 Credits.

Biology is the study of life. This course will consider the origin and evolution of life on Earth, natural selection, the diversity and the unity of life in all its many forms, the geological timelines as it applies to evolution, the modern sciences of taxonomy and phylogeny, including analysis of proteins, RNA and DNA for the purpose of building phylogenies of organisms, human evolution, and behavior as an adaptive mechanism. Lab sessions will be hands-on experiences revolving around the topics of the course. Two and one half lecture/discussion hours and two lab hours per week. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098 or placement; BIO 109 strongly suggested.

BIO 113. Life Science for Allied Health (formerly BIO 099). 3 Credits.

This course is designed to prepare students to succeed in Anatomy & Physiology I and II. Students build a foundation of biology concepts related to chemicals critical to life, cellular structure and function with emphasis on cellular transport, energy production and molecular genetics. Instruction will actively engage students in their learning and student success skills are integrated with the scientific body of knowledge as students prepare to enter various allied health programs. A GRADE OF 'C+' OR HIGHER IS REQUIRED FOR ADVANCEMENT TO NEXT COURSE. Prerequisites: ENG 098, MAT 092 (or corequisite), RDG 098 or placement.

BIO 116. Ecology. 4 Credits.

This course is the study of relationships between organisms and the environment. Ecology is a broad scientific discipline ranging from the study of individual organisms to the global scale. This is a course in modern experimental ecology that emphasizes the conceptual foundations of the discipline. Natural history provides our foundation, while evolution is the conceptual framework. The laboratory

focuses on lab and field experiments that use the scientific method to demonstrate key concepts and develop an understanding of experimental and statistical methods commonly used in ecology. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Fall.

BIO 120. Horticulture. 4 Credits.

This course is designed for those students interested in understanding the processes by which plants grow and how that understanding can be used to improve the quality of plants grown in the garden, the landscape, and the home. Students will also examine the structure and function of flowering plants. A workshop approach will be used and experiments will be conducted in the lab and greenhouse. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, RDG 098, MAT 092, or placement.

BIO 122. Zoology: The Biology Of Animals. 4 Credits.

This course focuses on the unity and diversity within the animal kingdom. Animals are found in every environment and have various roles or niches that they occupy in these environments. Each environment presents different problems that these animals overcome with various structural, functional, and behavioral adaptations. The study of these adaptations is the central theme of this course. Laboratory is an integral part of this course with a focus on comparative anatomy through dissection of preserved specimens. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, RDG 098, MAT 092 or placement.

BIO 128. Plants And Society. 3 Credits.

This course is a survey course looking at the origins, historical, and current use of plants in societies including food, spices, clothing, beverages, building material, and medicines. The search for and exploitation of many plant species by humans have directly and indirectly shaped the geopolitical world we now live in. These topics will follow a brief introduction to basic plant structure, function, and life cycle. The increasing role of plants in biotechnology will also be studied, as well as the important uses of algae and fungi as they relate to people, plants, and plant products. Prerequisites: ENG 098, FYE 101, RDG 098, MAT 092 or placement.

BIO 130. Plant Science. 4 Credits.

This course includes basic plant structure and function. This will include the anatomy and physiology of the plant cell, tissues, roots, stems, and leaf growth and development. Laboratory will include the study of the above with preserved and live specimens and with field study where possible. The effects of various plant pathogens on plant growth will be considered. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Fall.

BIO 140. Introduction To Greenhouse Management. 4 Credits.

Theory and practice of operation/management of a commercial greenhouse will be the major content of this course. This course will integrate the science of the greenhouse industry with the need to remain competitive. This four-credit lab science will use the MWCC greenhouse to study the science of the greenhouse including root substrate, fertilizer formulations, and the business of greenhouse management. Emphasis will be placed on chemical/non-chemical methods of control of plant pathogens. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Spring.

BIO 141. Fundamentals of Sustainable Agriculture. 4 Credits.

This course will explore what is meant by sustainable agriculture in contrast with “conventional” agriculture that has evolved and been practiced since the end of WWII. Food production in this country and much of the world has become an industrialized, mass production model with various high cost, chemically synthesized inputs supported by government policies, including the Farm Bill. In addition, a majority of commodity crops grown today in the USA are genetically engineered, which began in the 1990’s. We will exam alternatives to our “conventional” system of food production focusing on issues surrounding soil and water management, fertilization, pest control, and nutrient dense food production. These and other topics will not only be studied through classroom discussions, current readings, and documentary films, but also experientially through visits to local farms in our area. These interactive visits will expose students firsthand to a variety of growers that are practicing sustainability in producing farm products, both plant and animal. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or permission of Division Dean. Fall.

BIO 145. Introduction to Field Biology. 4 Credits.

A strong educational foundation in scientific principles should be rooted in some way to our own understanding of natural ecological systems. There are incredible challenges encountered when attempting to experimentally test scientific theories under unpredictable natural biological systems. Although not all students in introductory Field Biology courses will go on to become research scientists, the skills acquired in courses like this provide training on basic ecology, taxonomic identification, ecological survey methods, complex interactions, hypothesis testing, data analysis, and results interpretation. Lectures will be posted on Black Board three times per week and will be based on the text and supplemental material on related topics. The Laboratory portion of the course will

include 6 hr. and will consist of approximately 2/3 field work mostly at Wachusett Mountain State Reservation and 1/3 examination and specimen identification in the laboratory on campus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or permission of Division Dean.

BIO 152. Essentials of Anatomy and Physiology. 4 Credits.

Essentials of Anatomy and Physiology is an introduction to the basic anatomy and physiology of the human body with an emphasis on the interrelationships among the systems and their maintenance of homeostasis. The disruption of homeostasis in several disease models and in the aging process will also be considered. This course is designed for students pursuing a degree in selected programs such as practical nursing in Health Information Management. Class will focus on the physiology of the body systems while lab will primarily cover anatomy. In class and lab students will be expected to engage in independent and collaborative learning through analysis of case studies, problem solving, and hands-on laboratory exercises. A considerable amount of time outside of class is required to master course content through case study analysis, disease research, web based programs, and other assignments. Prerequisites: ENG 098, MAT 092, and RDG 098 or placement.

BIO 203. Anatomy and Physiology I (formerly BIO 199). 4 Credits.

This course applies the chemical and cellular basis of life to the human body systems focused on control & movement. An in-depth-study of the structure and function of the muscular, skeletal, nervous, endocrine and reproductive systems is provided. Instruction will actively engage students in their learning of theoretical concepts listed in the course syllabus; students also apply these concepts through hands-on laboratory experiences listed in the course syllabus. Students are strongly discouraged from taking BIO 203 concurrently with BIO 204. Prerequisites: Grade of C+ or better in BIO 113 (preferred) or BIO 109; ENG 098, FYE 101, MAT 092, RDG 098, or placement.

BIO 204. Anatomy and Physiology II. 4 Credits.

This course applies the chemical and cellular basis of life to the human body systems focused on processing & transporting chemicals. An in-depth-study of the structure and function of the digestive, cardiovascular, respiratory and renal systems is provided. Instruction will actively engage students in their learning of theoretical concepts listed in the course syllabus; students also apply these concepts through hands-on laboratory experiences listed in the course syllabus. Students are strongly discouraged from taking this course concurrently with BIO 203. Prerequisites: Grade of C+ or better in BIO 113 (preferred) or BIO 109; ENG 098, FYE 101, MAT 092, RDG 098, or placement.

BIO 205. Microbiology. 4 Credits.

This is a transferable four-credit laboratory science course. It is a required course for the Nursing curriculum at MWCC. It is recommended for students planning careers in health sciences or animal and plant sciences and will satisfy a lab science requirement here, or for transfer. In addition to a discussion of bacteria, fungi, protozoa, and other parasites, this course will discuss practical applications of the techniques of microbiology to the health care and industrial fields. This course is a medically-oriented course that surveys the broad aspects of this field of study. Topics include morphology and nutrition of microbes, pathogenic processes, host-defense mechanisms, allergy, antibiotic therapy, and a review of the common diseases of each system of the body. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement; BIO 113 (formerly BIO 099) or placement, BIO 109, BIO 203 (formerly BIO 199), or BIO 152 with grade of C or better.

BIO 209. Human Sexuality. 3 Credits.

This course is an in-depth study and discussion of all aspects of human sexuality. Emphasis will be on biological aspects and influences on human sexuality. Topics to be considered include structure, function, and dysfunction of the reproduction system, prenatal sexual development, achieving gender identity, sexual behavior, sexual signaling, health and control of sexual reproduction, correcting problems of sexual expression, divergent sexual behavior, and sexually transmitted diseases. Various media forms will be used. A primary objective of the course is a better understanding of one's own sexuality. Prerequisites: ENG 098, FYE 101, RDG 098, MAT 092 or placement. Offered occasionally.

BIO 210. Genetics. 4 Credits.

This course covers principles of prokaryotic and eukaryotic cell genetics. Emphasis is placed on the molecular basis of heredity, chromosome structure, patterns of Mendelian and non-Mendelian inheritance, and biotechnological applications. Students will learn about recent advances in biotechnology that have genetic implications, including the Human Genome Project and advances in genetic engineering technology. Emphasis will be placed on techniques of DNA extraction, DNA amplification (PCR), and recombinant DNA techniques. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: BIO 109, MAT 162 (or corequisite). Spring.

BIO 215. Cell Biology (formerly BIO 170). 4 Credits.

Cell biology is the study of the structure and function of prokaryotic and eukaryotic cells. In this course we will examine many different areas of cellular biology including: the structure, function, and biosynthesis of cellular membranes and organelles; cell growth and oncogenic transformation; transport, receptors, and cell signaling; the cytoskeleton, the extracellular matrix, and cell

movements; chromatin structure and RNA synthesis. Laboratories will focus both on exercises that help illustrate cellular phenomena, as well as on the introduction of techniques and procedures commonly utilized in modern cell and molecular biology research. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus. Prerequisites: BIO 109 and MAT 162 (or corequisite). Spring.

BIO 240. Survey of Diseases. 3 Credits.

This course will give the student an understanding of the various common diseases that are found in the different body systems. Emphasis will be on signs and symptoms, diagnosing methods, and treatment of the diseases. Course is geared for Allied Health majors. Prerequisite: BIO 152. Spring.