BIOLOGY

The Biological Science degree at Mount Wachusett Community College provides students with the opportunity to earn an Associate of 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. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations.

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. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations.

Year 1		
Fall		**Credits**
CHE 107	General Chemistry I	4
BIO 118	Biology I	4
ENG 101	College Writing I	3
MAT 162	College Algebra (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 119	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]		3-4
Social Science Elective [5]		3
Humanities Elective [4]		3
BIO 210	Genetics	4
	Total Credits:	**61-62**

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 for a Professional Elective.
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 116	Ecology	4
BIO 122	Zoology: The Biology Of Animals	4
MAT 143	Statistics	3
BIO 130	Botany: 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 of 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 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, MAT 092, RDG 098, or placement.

BIO 109. Concepts in Biology. 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement.

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. As part of the coursework you may have the potential of being, to some degree, exposed to various hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester’s course syllabus for specifics and expectations. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Fall.

BIO 118. Biology I. 4 Credits.
Biology is the study of life and living systems. Intended for STEM majors, this course places an emphasis on experimental design, data acquisition and analysis, and the presentation of scientific results using data visualization and technical writing. An introduction to scientific discovery, the structure and function of cells, the molecules of life, the production and use of energy by living organisms, the genetic code and patterns of heredity, as well as practical biotechnology applications 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement.

BIO 119. Biology II. 4 Credits.
Biology is the study of life. Intended for STEM majors, 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. As part of the coursework you may have the potential of being, to some degree, exposed to hazardous material.

If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Two and one half lecture/discussion hours and two lab hours per week. BIO 118 strongly suggested. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Fall.

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. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement.

BIO 130. Botany: 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations. 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. This course will emphasize plants native to New England and agriculturally relevant plants. This four-credit lab science will use the MWCC greenhouse to study the science of the greenhouse including root substrate, fertilizer formulations, the business of greenhouse management, permaculture practices and setting up a native plant nursery. Emphasis will be placed on chemical/non-chemical methods of control of plant pathogens and pests. Lab sessions will be hands-on experiences revolving around and applying the topics listed in the lab section of the syllabus and will include field trips both on and off campus. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations. Prerequisites: ENG 098, FYE 101, MAT 092, RDG 098, or placement. Spring.

BIO 142. Entomology: Insect Biology. 3 Credits.
This course focuses on agriculturally important insects, the detrimental and the beneficial. We will identify taxonomic insect orders, identify common features within those groups, and use keys to identify major agriculture important insects to family and some to the species level. In addition, we will explore conventional and biological methods of pest insect control in agricultural food systems. We will also discuss insect conservation and diversity. Students will also develop an insect photo collection. The lab and lecture portions of this course frequently take place in one of our many outdoor instructional spaces. Students are to refer to the applicable semester's course syllabus for specifics and expectations. Fall.

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. As a

part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: Grade of C+ or better in BIO 113 (preferred) or BIO 109 or BIO 118 or BIO 152; 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: Grade of C+ or better in BIO 113 (preferred) or BIO 109 or BIO 118 or BIO 152; 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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: Grade of C or better in BIO 113, or BIO 152, or BIO 203 (formerly BIO 199), or BIO 109, or BIO 118 or placement; ENG 098, FYE 101, MAT 092, RDG 098, or placement.

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. As a part of the coursework you may have the potential of being, to some degree, exposed to hazardous material. If you are pregnant, wear contact lenses or have other specific health concerns, you should consult your personal physician for advisement concerning your enrollment in the course. Prerequisites: BIO 118, MAT 162 (or corequisite). Spring.

BIO 225. Veterinary Parasitology. 4 Credits.
During this course, students will learn a variety of common internal and external parasites that are encountered in veterinary medicine. Students will be able to identify each parasite, both microscopically and grossly; the common symptoms associated with each parasitic infection; the life cycles; methods of testing; treatment and prevention strategies; as well as public health significance of each parasite covered. Veterinary technology students must pass the course with a C+ or better. Prerequisites: VTE 211, VTE 103 with a C+ or higher. Fall.