

BioScience Center of Excellence Course Descriptions

The BioScience COE courses, taught by Maren LaLiberty, MD, are offered in a four-year rotation and are directed at students with an interest in the health sciences, including medicine, biomedical engineering, scientific research, bioethics, and public health. In addition to the traditional study of anatomy, physiology, and pathophysiology, courses will include applications of physics, chemistry, mathematics, language, literature, and history wherever relevant. Class discussions and lectures will be supplemented with organ dissections and laboratory experiments. Courses in bioethics and public health will extend the year's studies further into the social and moral dilemmas of the health sciences. Writing, both scientific and reflective, as well as writing revision will be emphasized in these courses. Students who enroll in the BioScience COE will work on a self-directed project each year in addition to their work in the BioScience classes. *Prerequisites: B+ or higher in Biology, application to the program, BioScience Program Director permission.*

BioScience one trimester courses (offered to students in grades 9-11)

*BioScience: Biotechnology and Laboratory Science (Fall 2018)

(1 credit)

In this course, students will learn and practice the skills required to work in a university research laboratory. These skills include laboratory safety, measurement of chemicals, preparation of solutions, separation techniques, the growth of living cells in culture media, and the acquisition of data using assays and tests. In addition, students will review and apply mathematical concepts routinely used in laboratory work including proportions, graphing and statistics. Following the conclusion of this course, students will be encouraged to begin their own independent laboratory research project.

*BioScience: Digestive Anatomy and Physiology (Winter 2018-19)

(1 credit)

This course examines the digestive system and how it works with all other organ systems to provide the nutritional elements necessary for cell survival. A combination of informal lectures, class discussions, small group activities, organ dissections, laboratory experiments, and multiple writings will be utilized to enhance learning in this course.

*BioScience: Renal Anatomy and Physiology (Spring 2019)

(1 credit)

This course examines how multiple organ systems (urinary, digestive, respiratory, integumentary system) assist in removing waste products from the human body. A combination of informal lectures, class discussions, small group activities, organ dissections, laboratory experiments, and multiple writings will be utilized to enhance learning in this course.

BioScience: Skin/Musculoskeletal Anatomy and Physiology (Fall 2019)

(1 credit)

This course examines the group of organ systems (integumentary, musculoskeletal) that generally provides structural support and protection for the human body. A combination of informal lectures, class discussions, small group activities, organ dissections, laboratory experiments, and multiple writings will be utilized to enhance learning in this course.

BioScience: Nervous/Endocrine Anatomy and Physiology (Winter 2019-20)

(1 credit)

This course examines the group of organ systems (nervous, special senses, endocrine) that generally provides information transmission for the human body. A combination of informal lectures, class discussions, small group activities, organ dissections, laboratory experiments, and multiple writings will be utilized to enhance learning in this course.

BioScience: Bioethics (Spring 2020)

(1 credit)

This course examines the theories and standards used in making health-related ethical decisions. An introduction to ethical theory will be followed by the study of specific biomedical issues presented within the context of case studies. Emphasis will be placed on developing an understanding of and a proficiency at using a standard framework for analyzing ethical problems. Individual contributions to group discussion, supported by thorough and thoughtful reading and writing will be critical elements of this course.

BioScience: Cardiovascular Anatomy and Physiology (Fall 2020)

(1 credit)

This course examines the cardiovascular system and how it works together with the respiratory system to provide oxygen to the human body. A combination of informal lectures, class discussions, small group activities, organ dissections, laboratory experiments, and multiple writings will be utilized to enhance learning in this course.

BioScience: Respiratory Anatomy and Physiology (Winter 2020-21)

(1 credit)

This course examines the respiratory system and how it works together with the cardiovascular system to provide oxygen to the human body. A combination of informal lectures, class discussions, small group activities, organ dissections, laboratory experiments, and multiple writings will be utilized to enhance learning in this course.

BioScience: Public Health and Infectious Disease (Spring 2021)

(1 credit)

This course will serve as an introduction to the general concepts that form the foundation of community and public health with emphasis placed on the epidemiology and control of infectious diseases. In addition to class discussion and informal lectures, students will work on small group and individual projects throughout the course in order to come to their own understanding of the definition of public health.

BioScience Seminar

This yearlong course is offered each year to students in grade 12 and to Post Graduate students enrolled in the program.

BioScience Senior Seminar

(3 credit)

In this course, senior and post-graduate BioScience students will take part in a yearlong seminar-type experience very similar to that offered in a university setting. Under the guidance of the BioScience Program Director, students will act as a partner in their own education by practicing and demonstrating the skills that are characteristic of mature, independent learners. While concentrating on one specific health care-related topic each term, students will be expected to engage in independent background research on the topic, including identifying and reading related resource material online, in texts and in scientific articles. In addition, students will develop appropriate topic-related questions and points of interest in preparation for leading class discussions on the topic.

BioScience Research Methods and Independent Project

Each of the following year-long courses will be offered each school year.

BioScience: Intro to Research Methods and Independent Project

(3 credits)

In this course, first year non-senior BioScience students will a) be trained in how to read, understand and present scientific journal articles; b) become familiar with interacting appropriately with science professionals in academic settings outside of school; c) be introduced to the fundamentals of scientific research, including identifying a research question, conducting a literature review, developing and articulating a hypothesis, designing an experimental protocol, writing a research ethics plan, selecting a data-collection technique and an appropriate statistical tool for data analysis, presenting results, drawing conclusions from results, articulating the

implications of these conclusions, explaining limitations of a study, and proposing future projects; and d) apply these skills by designing and conducting an experimental research project on a health science-related topic of their choice. At the end of each term, each student will create a scientific poster summarizing the status of their project, and then present it to the faculty and students at a scheduled poster session.

BioScience: Intermediate Research Methods and Independent Project

(3 credits)

In this course, second year non-senior BioScience students will continue to improve the skills acquired in the previous year's course, "Introduction to Research Methods," including how to read scientific journal articles, how to interact with science professionals, and how to conduct authentic scientific research. Each student will either continue work on the previous year's research project or to begin a new research project. At the end of each term, each student will create a scientific poster summarizing the status of their project, and then present it to the faculty and students at a scheduled poster session.

BioScience: Advanced Research Methods and Independent Project

(3 credits)

In this course, third year non-senior BioScience students will further develop the skills learned in the first two "Research Methods" courses, including how to read scientific journal articles, how to interact with science professionals, and how to conduct authentic scientific research. Each student will either continue work on their previous year's research project or begin a new research project. At the end of each term, each student will create a scientific poster summarizing the status of their project, and then present it to the faculty and students at a scheduled poster session.

BioScience: Applied Research Methods and Independent Project

(3 credits)

In this course, senior and post-graduate BioScience students will be expected to apply all the skills and knowledge acquired in the previous "Research Methods" courses to the design and conduct of an original research project. This process will include identifying a research question, conducting a literature review, developing and articulating a hypothesis, designing an experimental protocol, writing a research ethics plan, selecting a data-collection technique and an appropriate statistical tool for data analysis, presenting results, drawing conclusions from results, articulating the implications of these conclusions, explaining limitations of their study, and proposing future studies. At the end of the Fall and Winter terms, each student will create a scientific poster summarizing the status of their project, and then present it to the faculty and students at scheduled poster sessions. During the Spring term, each student will present a 10-minute oral presentation of their research project to the SSM faculty.