

# COURSE DESCRIPTIONS - BIOMEDICINE GRADUATE PROGRAM

## **BMC 552 Cell Biology (3 SH)**

A study of cellular architecture, communication, transport, motility, division, growth and death. Particular emphasis is placed on the study of cancer at the cellular level, and on a quantitative (mathematical) understanding of cellular movements. Students read and report on research articles. (Fall 2022)

## **BMC 561 Foundational Biochemistry (3 SH)**

A survey of structure-function relationships of biological molecules and systems. Emphasis is placed on enzymology, intermediary metabolism, and metabolic control.

## **BMC 562 Human Physiology (4 SH)**

An investigative study of selected body systems including neuro-muscular, cardiovascular, respiratory, renal, and endocrine physiology. Extensive laboratory work emphasizes quantification and experimentation while using live materials and physiologic instrumentation

## **BMC 598 Biomedicine Practicum (1-3 SH)**

This course features experiential community learning in areas related to future vocation. Assigned shadowing or interactive experiences require 30-40 hours per semester credit hour outside of class as well as completing assigned related readings, maintaining a journal of experiences, providing feedback to other students. Typical experiences may involve interactions within hospitals, health care professionals, biomedical organizations, clinics, rescue squads, health departments, or life science education settings. Prerequisites: satisfactory completion of at least two graduate level courses and/or instructor permission. A maximum of 4 SH of practicum credit can be applied toward a degree.

## **BMC 610 Interdisciplinary Seminar I (2 SH)**

This course involves a first orientation to the biomedicine program. Major discussion topics include the current status of biomedicine and healthcare in the United States, quality improvement in healthcare, discovering biomedicine in the humanities, secular and religious approaches to bioethics, holistic healing, and integrative medicine.

## **BMC 611 Interdisciplinary Seminar II (2 SH)**

This course challenges students to grow in capacity for leadership in the medical field. Strategies include: reflection on leadership history, aptitudes and style; creating an inventory of current leadership skills while identifying gaps for future growth. Special attention is also given to addressing population management risks as well as public health promotion opportunities. The course concludes with transformative medical leadership applications on the individual and collective levels.

## **BMC 612 Human Gross and Microscopic Anatomy (4 SH)**

A comprehensive overview of the anatomy of the human body, both on the microscopic and whole-organ level. The laboratory section of this course will utilize human cadaver dissection for the hands-on identification of the structures discussed in lecture.

## **BMC 613 Biomedical Research Design and Statistics (2 SH)**

This course covers basic principles of research methodology and experimental design. Topics include research design, measurements, hypothesis testing, statistical significance and the analysis of data. A computer statistical package is used to analyze data. Students critically evaluate published reports of biomedical studies with specific attention to their experimental design and the application of statistics.

### **BMC 623 Research in Biomedicine (3 SH)**

Under the direction of a faculty member, this course guides a student through the process of developing an original research project. Each student selects a specific biomedicine-related topic, develops a hypothesis and research proposal, and then tests and analyzes the data that they generate. By gathering and analyzing their own original data in relation to other relevant literature, students gain understanding and insight on their chosen topic and contribute to new information that is being generated in their field. The outcome includes preparing and defending an oral presentation and a research paper written in a CSE style. *This is a series of two courses. Students enrolled in BMC 623 Research in Biomedicine in the summer will subsequently be enrolled in BMC 623 Research in Biomedicine in the fall.*

### **BMS 501 Biomedical Organic Chemistry I (4 SH)**

Study of the relationship between the three-dimensional structure and the reactivity of carbon compounds. The chemical and physical properties of organic compounds will be linked to an understanding of orbital theory, electronegativity, strain, and sterics. Reactions of simple organic compounds will be described in terms of electron movement (mechanisms) and kinetic vs. thermodynamic parameters. The laboratory sessions emphasize purification, isolation, and identification techniques, particularly chromatography, infrared spectroscopy, mass spectroscopy, and nuclear magnetic spectroscopy. Three lectures and one four-hour laboratory per week.

### **BMS 502 Biomedical Organic Chemistry II (4 SH)**

Building on the prior course, this course deduces “new” mechanisms based on key principles of conformational preference, sterics, polarity, and bond strength. Aromatic compounds as well as oxygen and nitrogen containing compounds are studied so that the chemistry of biomolecules can be introduced. Structural determination of increasingly complex compounds by instrumental techniques, such as GC-MS, NMR, and IR will also be emphasized. The laboratory involves multi-step transformations, purifications, and advanced structure determination using primarily instrumental techniques. Three lectures and one four-hour laboratory per week.

### **BMS 517 Developmental and Stem Cell Biology (4 SH)**

This course provides students with an introduction to development and stem cell biology that emphasizes the molecular influences and cellular interactions involved in specification, differentiation and regeneration. Topics include: descriptive and experimental approaches in development, methodologies in stem cell research, embryonic and adult stem cells, stem cell cloning, cell reprogramming and cancer stem cells. Laboratory sessions will explore topics at the intersection of developmental biology and stem cells, and will use a variety of model organisms. A mini-research project is required.

### **BMS 530 MCAT Preparation Course (3 SH)**

This course will provide a comprehensive review of all topics found on the Medical College Admission Test (MCAT). The following subjects will be covered: Math/Research and Reasoning Skills, Critical Analysis and Reading Skills (CARS), Biology, Biochemistry, Physics, Organic Chemistry, General Chemistry, Psychology, and Sociology. The course will be conducted entirely online via [NextStepMCAT.com](https://www.nextstepmcats.com). Instruction is offered in both videos available on demand 24/7 and live sessions offered 5 times each week. Students will have access to their course tools for 6 months. Students will receive a pass/fail grade for this course.

### **BMS 531 DAT Preparation Course (3 SH)**

This course will provide a comprehensive review of all topics found on the Dental Admission Test (DAT). The following subjects are covered: natural sciences including biology, general chemistry, and organic chemistry; perceptual ability; reading comprehension; and quantitative reasoning. Students will utilize online and print materials to review and practice DAT subject material. Students will receive a pass/fail grade for this course. To enroll, students must have an EMU GPA of 3.2 and must be applying to dental school in the upcoming application cycle with EMU's support. Students who have taken and passed the course previously may not re-enroll in the course.

**BMS 540 Drugs: Discovery, Design and Action (2 SH)**

In this class, we will study the principles that govern the process of modern drug discovery and development and to gain insight to the modes of activity of the major classes of drugs (antibiotics, antivirals, analgesics, anticancer, steroids, antihistamines, etc.) Students will primarily be evaluated based on appropriate scientific writing.

**BMS 561 Immunology (3 SH)**

Survey of immunology including the nature of antigens and antibodies, the reactions between them, applications of these reactions to clinical diagnosis and the cellular events which occur during the immune response. Beneficial and pathological aspects of immunity are included.

**BMS 562 Neurobiology (3 SH)**

This course is an advanced survey of nervous system anatomy and physiology with an emphasis on recent advances in the field. There is a wide gamut of subject matter in the field of neuroscience, and this course familiarizes students with the breadth of the field while going into depth for several chosen topics, determined primarily by recent publications. We investigate neuroscience from neurotransmitter receptor structure and function to the philosophical study of consciousness. (Spring 2023)

**BMS 563 Molecular Genetics (3 SH)**

A study of the mechanisms of gene structure, stability, replication, transmission, and expression in eukaryotes. Themes include molecular evolution, viruses (including HIV), and heritable diseases. Students read and report on research articles. The laboratory involves an introduction to common techniques employed in molecular biology followed by directed research projects of the student's choosing. (Spring 2022)

**BMS 570 Medical Microbiology (3 SH)**

A comprehensive study of the field of microbiology, emphasizing the principles of medical microbiology and human symbioses. Included in the discussion will be additional focus on disease, treatment, emerging infectious diseases, biotechnology and global public health. Topics will be discussed using lectures, short lab periods, case studies and problem-based learning. (Spring 2023)

**BMS 571 Abnormal Psychology (3 SH)**

An interdisciplinary approach to understanding abnormal (maladaptive) behavior emphasizing the crucial roles of learning and life stressors in the development and maintenance of abnormal behaviors. The clinical characteristics, causal factors, and treatments of maladaptive behavior patterns are examined, including the areas of assessment, therapy and prevention. Positive emotions and strengths that promote mental health will be integrated throughout the course.

**BMS 572 Cognitive Psychology (3 SH)**

The field of cognitive psychology involves studying and thinking about thinking. Questions are asked about how we acquire, store, retrieve, and use knowledge. Students will actively study and apply various theories about human thinking. Topics such as models of memory, imaging, language comprehension, problem-solving, creativity and cognitive development will be covered.

**BMS 573 Theories of Personality (3 SH)**

PSYC 361 - Empirical strategies that are particularly relevant to the study of personality process, human behavior and human experience provide a systematic study of the person. Major theories and principles of personality adjustment are studied, such as dispositional, genetic, cognitive and biological factors related to the understanding of personality. Prerequisite: PSYC 331.

**BMS 574 Neuropsychology (3 SH)**

Survey of the anatomy and physiology of the nervous system, including loss of function studies. Emphasis is placed on the role of general physiological principles that affect human behavior. (Spring 2022)

### **BMS 579 Analytical Chemistry I (2 SH)**

An overview of the various aspects of analytical chemistry such as sampling, statistical analysis of data sets, quantitative and qualitative analysis, spectroscopy and chromatography, and trouble-shooting/ instrument design and maintenance. Emphasis will be given to Gravimetric and Titrimetric analysis, Ultraviolet and visible spectroscopy, Advanced GCMS and ion-selective electrodes. One lecture, four hours of laboratory.

Prerequisite: an annual safety training outside of class. (Fall 2022)

### **BMS 580 Analytical Chemistry II (2 SH)**

An overview of the various aspects of analytical chemistry such as sampling, statistical analysis of data sets, quantitative and qualitative analysis, spectroscopy and chromatography, and trouble-shooting/ instrument design and maintenance. Emphasis will be given to Atomic spectroscopy, NMR spectroscopy including multi-dimensional analysis and nuclei beyond C and H, HPLC. One lecture, four hours of laboratory. Prerequisite: an annual safety training outside of class. (Fall 2021)

### **BMS 585 Infectious Diseases (3 SH)**

This online course will take an introductory look at infectious disease from a public health perspective. We will focus on factors that contribute to disease transmission in global populations and will introduce basic concepts of epidemiology, human disease, microbiology, immunology, and vaccination to provide a foundation for understanding health promotion and health behavior with regard to controlling the spread of infection through a community. This course will use lecture, discussion, case study, videos, and relevant current events to explore infection and infection control.

### **BMS 595 Bioinformatics (2 SH)**

This course teaches the bioinformatics skills used in academic and biotech laboratories for analyzing individual DNA and protein sequences. The focus is extensive hands-on experience using mainstream web-based bioinformatics tools. Laboratory based course that addresses biological questions by analyzing sequences, searching databases, using sophisticated software, and interpreting results. (Spring 2023)

### **BMX 603 Cross Cultural Health Care (3 SH)**

This summer course is experiential based and requires involvement and study in another cultural-setting for a three-week period. Students, under guidance from the instructor, explore values, methods, and outcomes of health care or the practice of biomedicine in a unique cultural setting. Differentiation of resources, social, psychological, and spiritual ideas contrasting the student's personal culture with the explored culture are examined. Involvements with alternative medicine and healing practices are considered as are examination of traditional health care delivery methods in the studied culture. Cross-cultural settings may vary but frequently include trips to Guatemala, Honduras and/or Peru. *A 3.0 GPA is required at the end of fall semester to be eligible to take BMX 603 the following summer.*

### **BMX 611 Biomedicine, Faith and Ethics (3 SH)**

This course explores relationships between science and Christian faith by investigating scientific foundational ideas and their interaction with theology. Topics such as global and human origins, chance and complexity, human nature, mind, health and healing, environmental and medical ethics are examined and viewed through the lenses of Scripture, theology, and natural science. Students will be led to form and articulate a multidimensional world view that incorporates the realities of science and a holistic Christian faith.