

# BIOMEDICAL SCIENCES

## Graduate Study in Biomedical Sciences

Program Director: Garrett Soukup, Ph.D.

The Department of Biomedical Sciences offers programs of study culminating in the Ph.D. and M.S. degrees. Completion of the programs prepares individuals for research careers in academia, institutes, or industry. The programs are flexible and employ a multi-disciplinary approach using our research, courses, and facilities to cater to the career needs and research interests of the individual student, in diverse areas of study in:

Biochemistry and Bio-organic Chemistry  
 Cancer Biology and Aging  
 Cell and Developmental Biology  
 Molecular Biology and Gene Regulation  
 Neurobiology and Neurodegenerative Diseases  
 Physiology  
 Pulmonary and Vascular Biology  
 Hearing and Hearing Disorders

The Department encourages collaborative research interaction with faculty in the Departments of Biology, Chemistry and Biochemistry, Medical Microbiology and Immunology, Medicine, Pharmacology, Physics, Surgery, the Osteoporosis Research Center, the Boys Town National Research Hospital, and the Veteran's Administration Hospital.

Students are trained mainly through participation in research, thus emphasis is given to placement of students in research laboratories early in their program. A faculty advisory committee will determine the elective courses most appropriate and that best meet the individual's training.

### Mission Statement

The mission of the Department of Biomedical Sciences graduate programs is to provide excellent academic programs that educate and train the next generation of scientists, educators, and health-related professionals through scholarship and research that fosters creativity, discovery, and community service.

### Program Goals

At the completion of this graduate program in Biomedical Sciences, students will:

1. Demonstrate advanced knowledge in molecular and cellular biology and in their field of specialization.
2. Demonstrate independent critical and analytical thinking, both within their field of study and beyond, for use in the service to others.
3. Identify and suggest possible solutions to ethical dilemmas that occur in their work and field of study, and understand the importance of professional ethics in all aspects of scientific communication and laboratory work.
4. Demonstrate competence in the laboratory, including application of the scientific method and appropriate use of basic and state of the art laboratory tools and techniques.
5. Demonstrate written and oral skills necessary for communication of research, knowledge, and ideas to scientists and non-scientists.

### Admission Requirements

1. A bachelor's degree or equivalent, preferably with satisfactory completion of course work in a biological, chemical or physical science.
2. A GPA of 3.0 overall.
3. The Graduate School requires all students from countries in which English is not the native language to demonstrate competence in English. A minimal score of 90 on the Internet-based Test (iBT) at the graduate level is required for this program.

The deadline for applications to the doctoral program is February 1 for admission in the fall semester. The deadline for applications to the masters program is May 1 for admission in the fall semester.

### Biomedical Sciences Degree Programs

M.S., Major in Biomedical Sciences (<http://catalog.creighton.edu/graduate/graduate-programs-courses/biomedical-sciences/biomedical-sciences-ms/>)

Ph.D., Major in Biomedical Sciences (<http://catalog.creighton.edu/graduate/graduate-programs-courses/biomedical-sciences/biomedical-sciences-phd/>)

### Courses

#### BMS 609. Introduction to Omics Data Analysis. 1 credit.

this is an introductory course to familiarize students with the principles of bioinformatic and computational analysis of transcriptomic, genomic and epigenomic data. A few hand-on projects will be designed for the students to practice the basic analyzing skills and to stimulate their interests for more advanced applications. P. BIO 202 or BMS 622.

#### BMS 622. Biochemistry, Molecular and Cell Biology. 4 credits.

This course covers fundamental principles of structural biochemistry and metabolism, and molecular and cell biology. P. IC.

#### BMS 630. Fundamentals of Hearing. 3 credits. FA, SP, SU

This is an advanced graduate level course focusing on the anatomy and physiology of the auditory system. The course will introduce students to the basics of normal human hearing with a focus on the peripheral auditory system, neural coding of sound, and the perception of simple sounds. P. Gr. Stdg. or IC.

#### BMS 708. Cancer Biology. 2 credits.

This course covers the biology of aging at the molecular, cellular, and organismal level, as well as discussions on age-related diseases. Topics include sections on cellular and molecular pathways of aging, model organism of aging, and the interrelationship between aging and disease, including hearing loss, cardiovascular disease, neurodegeneration, and cancer. P. BMS 622 or DC.

#### BMS 720. Advanced Topics in Molecular Structure/Function. 3 credits. FA, SP, SU

This course covers functional aspects of molecular structure, peptide chemistry, and molecular interactions. Topics vary will change with each iteration of the course permitting students to repeatedly enroll in the course but with each covering a different topic. Nine credit hours are the maximal applicable toward the degree. P. IC.

#### BMS 722. Mass Spectrometry and Biomedical Applications. 3 credits.

The Mass Spectrometry and Biomedical Applications course is designed to provide the necessary background for understanding the fundamental principles of mass spectrometry and application of this technique to answer questions in molecular and cellular biology. P. BMS 622.

**BMS 730. Advanced Topics in Cell and Molecular Biology. 3 credits. FA, SP, SU**

This course covers functional aspects of eukaryotic cells including gene regulation/expression, signal transduction, and cell-cell and cell-substrate interactions. Topics vary will change with each iteration of the course permitting students to repeatedly enroll in the course but with each covering a different topic. Nine credit hours are the maximal applicable toward the degree. P. IC.

**BMS 740. Advanced Topics in Physiology. 3 credits. FA, SP, SU**

This course covers specific aspects of physiology and pathophysiology of whole organisms and organ systems as well as cellular physiology. Topics vary will change with each iteration of the course permitting students to repeatedly enroll in the course but with each covering a different topic. Nine credit hours are the maximal applicable toward the degree. P. IC.

**BMS 750. Advanced Topics in Morphology and Anatomy. 3 credits. FA, SP, SU**

This course covers functional morphology ranging from cellular ultrastructure to gross anatomy and embryology. Topics vary will change with each iteration of the course permitting students to repeatedly enroll in the course but with each covering a different topic. Nine credit hours are the maximal applicable toward the degree. P. IC.

**BMS 760. Advance Topics in Neuroscience. 3 credits. FA, SP, SU**

This course integrates the areas of neuroanatomy, neurophysiology, neuropharmacology, and neuropathology at the cellular and organismal level. Topics vary with each iteration of the course permitting students to repeatedly enroll for the course but with each covering a different topic. Nine credit hours are the maximum applicable toward the degree. P. IC.

**BMS 791. Seminar. 1 credit. FA, SP**

This course consists of formal oral presentations and critical discussions of assigned subjects to familiarize students with the nature and extent of research literature, the analysis of research papers, and the collation and presentation of scientific information. This course is repeatable. P. IC.

**BMS 792. Journal Club. 1 credit. FA, SP, SU**

This course consists of detailed examination of the physiology, cell biology, and molecular biology of the nervous system, with emphasis on mammalian systems. The course will include membrane physiology, ion channels, synaptic physiology, neurotransmitters and receptors, sensory receptors, neural circuits, and advanced techniques. P. IC.

**BMS 795. Directed Independent Study. 2 credits. FA, SP, SU**

Each student, supervised by faculty members, will pursue in-depth reading and discussions on current research topics of interest to faculty and students. The purpose is to provide an environment whereby the student is introduced to scientific research methods and can improve critical thinking and reading skills as well as exchanging scientific information. P. IC.

**BMS 797. Directed Independent Research. 1-9 credits. FA, SP, SU**

This course consists of original investigation under supervision and guidance of individual staff members. P. IC.

**BMS 799. Master's Thesis. 1-3 credits. FA, SP, SU**

This course consists of review of the literature and research data; writing of the thesis. Students must register for this course in any term when engaged in formal preparation of the Master's thesis; however, six credit hours are the maximum applicable toward the degree. P. IC.

**BMS 899. Doctoral Dissertation. 3-6 credits. FA, SP, SU**

This course consists of review of the literature and research data and the writing of the dissertation. Students must register for this course in any term when engaged in formal preparation of the doctoral dissertation; however, twenty credit hours are the maximum applicable toward the degree. P. IC.