MHS IN BIOMEDICAL SCIENCES ONE-YEAR OPTION

Program Contact: Martine Mirrione
(martine.mirrione@qu.edu) 203-582-8117

This academic enhancement program provides an 11-month pathway for students to earn a Master of Health Science (MHS) in Biomedical Science (BMS). The program is suited for students with a strong science background preparing for application to medical or dental schools. Coursework is focused on a comprehensive study of health and disease, which serves as the foundation of modern medical practices and healthcare research. Graduates gain the knowledge, skills and training to lead today's rapidly changing healthcare industry. The accelerated Biomedical Sciences master's program at Quinnipiac is specially designed to enhance the educational needs of students toward a degree in medicine or dentistry, including offering MCAT or DAT preparation and application support. The program provides training that is necessary to stay current with today's rapidly changing technology and to assume positions of greater responsibility, with employment in the research/development industry, diagnostic companies, or laboratories conducting biomedical or clinical research. A laptop is required for all students enrolled in the MHS in BMS program.

Program of Study

Students are required to complete the non-thesis option and a specialized medical concentration for this accelerated program, but can use open electives to participate in faculty-mentored student research (BMS 688 and BMS 689) .

Non-Thesis Option Requirements

The accelerated curriculum includes a minimum of 32 credits including 2 credits of comprehensive examination (BMS 670). Students are required to take the medical focused courses listed below. They have the ability to choose 10 credits of science elective courses or independent study based on personal interest.

Course	Title	Credits
First Year		
Summer Semester		
Summer II Start Date		
BMS 527	Pharmacology	3
BMS Science Elective(s)		3
	Credits	**6**
Fall Semester		
BMS 502	Research Methods	4
BMS 522 & 522L	Immunology and Immunology Lab	4
BMS Science Elective(s)		3
Take at least one credit of the following variable credit courses:		1
BMS 503	Professional Development in Biomedical Sciences	
BMS 681	Research Methods in Biomedical Sciences I	
BMS 688	Independent Study	
	Credits	**12**
Spring Semester		
BMS 518	Pathophysiology	3
BMS 556	Seminar in Health Care Disparities	1
BMS 564	Fundamentals of Oncology	4
BMS Science Elective(s)		4
BMS 670	Comp Exam/Biomedical Sciences	2
	Credits	**14**
	Total Credits	**32**

Comprehensive Examination

The comprehensive examination in medical laboratory sciences (2 credits) is a requirement for the non-thesis option in the Biomedical Sciences program. The purpose of the exam is twofold. First, the student must demonstrate broad and specific knowledge expected of someone holding a master's degree. Second, the student must be able to integrate knowledge obtained from individual courses into unified concepts which link the student's own specialization to other fields of study. The student is given two opportunities to demonstrate competency. A written essay exam is administered by a designated faculty member. Students should schedule an appointment with the program director before registering for the comprehensive exam.

Graduate Science Electives

Open electives are fulfilled with any graduate BMS Science electives (p. 2) offered. The course list below includes additional **Biology** courses that may also apply to the accelerated MHS in BMS degree (limited seats, based on space availability).

Code	Title	Credits
Open Electives		
BIO 515	Advanced Biochemistry	4
BIO 568	Molecular and Cell Biology	4
BIO 571	Molecular Genetics	4

Student Learning Outcomes

Upon completion of the program, students will demonstrate the following competencies:

1. **Scientific Knowledge:** Demonstrate an advanced understanding of translational science in biomedical and microbiological topics.
2. **Disease Mechanisms**: Identity factors that influence human health and disease.
3. **Translational Science:** Critically analyze scientific literature and develop critical thinking skills necessary to implement evidence-based translational research.
4. **Professional Skills**: Master the essential technical skills critical for success in a laboratory environment.
5. **Effective Scientist**: Engage in the scientific process including research ethics, experimental design and data collection and analysis.
6. **Responsible Citizen:** Evaluate the social and ethical impact of scientific discoveries on medical practice.

Mission Statement

The mission of Quinnipiac University's Master of Health Science in Biomedical Sciences accelerated program is to provide students with the cutting-edge skills they need to manage the more complex operations carried out today in hospitals and research facilities, as well as allowing

students to develop their critical thinking skills and knowledge of the biomedical sciences, sought after by medical and dental schools. The focused curriculum in medical sciences with advanced electives offers comprehensive knowledge to meet the educational and technical needs of students as they develop a strong foundation for success in advanced training and employment. The two curricular concentrations included in the traditional program (medical sciences and microbiology) offer additional opportunities to integrate specialty courses into the curriculum, as well as supporting experiential learning in research and clinical internships. Students are guided in the principles and methods of scientific research, and they gain knowledge of the latest advances in biomedical, biotechnological, and laboratory sciences—all directly applicable to real-world work environments, medical research, and healthcare.

To be considered for admission into the Biomedical Sciences accelerated master's program, applicants must meet the following requirements:

- Bachelor's degree in the biological, medical or health sciences from a regionally accredited institution in the U.S. or Canada.
- Scores for the tests of English as a Foreign Language (TOEFL) or International English Language Testing System (IELTS) if the applicant is from a non-English speaking country.
- A minimum undergraduate GPA of 3.00; however the most successful applicants have a GPA of 3.20 or higher. The cumulative, pre-med, and overall science GPA are evaluated.
- All undergraduate transcripts submitted.
- Completion of undergraduate prerequisite courses for application to most medical or dental schools.
- Detailed autobiography of personal, professional, and educational achievements (resume).
- Strong extracurricular portfolio, including evidence of service mindset (*e.g.*, volunteerism), clinical experiences, and/or research experiences.
- Authentically written personal statement indicating why the student would like admission into the program with career plan and goals.
- Two letters of reference detailing the applicant's academic and interpersonal strengths.

Applications may be obtained from the Office of Graduate Admissions. Applicants should refer to the graduate admission requirements (http://catalog.qu.edu/graduate-studies/#admissionstext) found in this catalog. Applications to this program are accepted throughout the year. Incoming students will start the program in the summer II semester.

BMS 502. Research Methods. 4 Credits.
This course involves topics related to developing scientific, analytical and laboratory skills, including written and oral communication, critical thinking and reasoning, scientific inference and information literacy. The purpose of the course is to examine, discuss and perform current methods used by research scientists and health care workers. Topics include recombinant DNA and protein techniques such as western blotting as well as experimental design and data analysis.
Prerequisites: None
Offered: Every year, All

BMS 503. Professional Development in Biomedical Sciences. 1 Credit.
This course aims to assist students in developing their individual career and professional development plans within the field of research and medicine. Topics include: exploring job search strategies, graduate and medical school applications, resume and cover letter preparation, interviewing skills, effective communication and presentation skills, professionalism and ethical behavior. This course is graded on a pass/fail basis.
Prerequisites: None
Offered: Every year, Fall

BMS 504. Quality and Safety in Healthcare Organization. 3 Credits.
This course will introduce students to the science of quality improvement, error reduction, and patient safety from the perspective of healthcare organizations. Medical errors, quality and safety initiatives, intervention strategies, and institutional challenges to improve patient care in the US healthcare systems will be discussed. Case-based studies will be used to cover complex topics in real-world settings. Students will earn a Basic Certificate in Quality and Safety through the Institute for Health Care Improvement.
Prerequisites: None
Offered: Every year, Fall

BMS 508. Advanced Biology of Aging. 3 Credits.
Why we age has been the eternal question and the most unsolved mystery in the history of mankind. However, we are gradually able to elucidate some of the secrets that regulate aging processes. This course focuses on the fundamental physiological deviations that occur during the aging process in individual tissue and organ systems and the various theories that attempt to define the reasons for these deviations. The course also emphasizes pathologies related to aging that are time regulated alterations in cellular, physiological and biochemical functions.
Prerequisites: None
Offered: Every year, Fall

BMS 510. Biostatistics. 3 Credits.
This course covers the application of statistical techniques to the biological and health sciences. Emphasis is on mathematical models, collection and reduction of data, probabilistic models estimation and hypothesis testing, regression and correlation, experimental designs and non-parametric methods.
Prerequisites: None
Offered: As needed

BMS 511. Writing for Scientists. 3 Credits.
Students develop skills in expository writing in the context of scientific forms. This course covers how to construct a hypothesis and develop an argument through analysis and critical thinking, how to write and present research papers, and other related topics. Intensive written exercises draw on student experience to clarify professional expression in practical situations. Readings include journalistic and scientific articles.
Prerequisites: None
Offered: As needed

BMS 515. Advanced Pathophysiology I. 3 Credits.
Essential concepts of pathophysiology are emphasized. Normal function and selected disorders are studied especially as they relate to homeostatic and defense/repair mechanisms. Where appropriate the course includes clinical correlations of disease states with symptoms and physical findings.
Prerequisites: None
Offered: As needed

BMS 516. Advanced Pathophysiology II. 3 Credits.
Concepts of pathophysiology are continued in this course, with an emphasis on selected disorders of the human system. Relationships between normal physiologic function, pathogenesis and pathology are discussed. The course includes clinical correlations of disease states with physical and laboratory findings.
Prerequisites: Take BMS 515.
Offered: As needed

BMS 517. Human Embryology. 3 Credits.
This course considers the fundamental processes and mechanisms that characterize the embryological development of the human organism. Knowledge of the developing human serves as a basis for understanding normal relationships of body structures and causes of congenital malformation. Emphasis is on clinical as well as classical embryology.
Prerequisites: None
Offered: Every year, Fall

BMS 518. Pathophysiology. 3 Credits.
Disease processes are studied as they relate to normal physiological and homeostatic mechanisms, basic pathology, pathogenesis, and defense/repair mechanisms. Where appropriate, the course includes some clinical correlations of disease states with signs, symptoms and lab findings. This course also is offered online in the spring.
Prerequisites: None
Offered: Every year, Spring

BMS 519. Computational Biomedicine. 3 Credits.
Recent technological advances and sequencing efforts have led to a rapid influx of biomedical data. This course provides students with a foundation in analyzing big data as it pertains to biomedical applications. Computational skills represent an increasingly useful toolkit for many modern biomedical and data science careers in both academia and industry. Although no prior programming experience is required, a working knowledge of biology and genetics is expected for this course, which is designed for students to gain hands-on experience in a thriving field.
Prerequisites: None
Offered: Every year, Spring

BMS 520. Neuropharmacology. 3 Credits.
This course explores the effect of drugs on cells, synapses and circuits within the nervous system. Students examine neurotransmitter and neuromodulatory systems in depth as pharmacotherapeutic targets for the treatment of psychiatric and neurological disorders. Students also comprehensively evaluate the effect of drugs on cognition and behavior.
Prerequisites: None
Offered: As needed

BMS 521. Advances in Hematology. 3 Credits.
This course covers fundamental concepts and advances in human hematology including an in-depth study of the function, physiology and diseases associated with blood cells, hematopoiesis, bone marrow examination, evaluation of red cell morphology, disease processes that lead to abnormal red cell morphology, anemias and thalassemias, white blood cell differentiation, and white blood cell disorders both benign and malignant, in-depth discussion of the morphologic and immunologic classification of leukemias, a review of myelodysplastic syndromes, myeloproliferative disorders, lymphomas and lipid storage disease and platelets. Emphasis on identifying normal and abnormal WBC and RBC and indices as leads to diagnosis using the hemogram, blood smears and case studies. Course includes an overview of general hematological methods and molecular hematologic techniques used in the diagnosis of blood cells disorders.
Prerequisites: None
Offered: As needed

BMS 522. Immunology. 3 Credits.
This course examines theories, techniques and recent advances in immunology and the latest knowledge on immunoglobulins, complement, the role of T and B cells in immune response study of allergy, tumor and transplantation immunology, and autoimmune diseases. The principles of immunology and how they apply to the diagnostic laboratory are discussed. Techniques studied include immuno- and gel-electrophoresis and fluorescent antibodies.
Prerequisites: None
Offered: Every year, Fall

BMS 522L. Immunology Lab. 1 Credit.
This is an interactive, hands-on, project-based laboratory course examining various aspects of the human immune system, including both the innate and adaptive immune response. Students gain experience with standard laboratory techniques such as ELISAs, gel electrophoresis, Western Blotting, with an emphasis on quantitative reasoning and critical thinking. This course must be taken in conjunction with BMS 522 lecture.
Corequisites: Take BMS 522.
Offered: Every year, Fall

BMS 525. Vaccines and Vaccine Preventable Diseases. 3 Credits.
This immunology course involves the investigation of vaccines and vaccine preventable diseases. The purpose of the course is to examine and discuss the current understanding of vaccinations, as well as the historical and current implication of vaccine preventable diseases. By the end of the semester, students should gain knowledge about vaccine preventable diseases, understand how vaccines work, how they are made, who recommends vaccines, the childhood vaccination schedule, when they should be given and why they are still necessary. Most importantly, students should be able to explain why vaccines are safe, and to be able to debunk the current myths and misconceptions regarding vaccines. Upper-level undergraduates may take course with permission.
Prerequisites: None
Offered: Every other year, Spring

BMS 526. Epidemiology. 3 Credits.
This graduate-level course in epidemiology directs itself toward application of epidemiological principles. The course involves analysis of prospective and retrospective studies, cross-sectional studies and experimental epidemiology. Both communicable and chronic disease case studies are used, as well as case studies of occupationally induced diseases. The use of biostatistics in epidemiological studies is stressed. This course covers basic epidemiology principles, concepts and procedures useful in the surveillance and investigation of health-related states or events.
Prerequisites: None
Offered: Every other year, Fall

BMS 527. Pharmacology. 3 Credits.
This course provides students with knowledge of the foundations and advances in pharmacology. The first third of the class covers the basic principles of the FDA drug process, pharmacodynamics, pharmacokinetics, therapeutics and toxicology. The rest of the course is devoted to clinical review of the basic classes of drugs.
Prerequisites: None
Offered: Every year, Summer

BMS 528. Advanced Clinical Parasitology. 4 Credits.
This course presents an advanced study of protozoan and helminth parasites of humans. Lecture focuses on the epidemiology and treatment of selected diseases. Laboratory focuses on clinical diagnosis, diagnostic techniques including immunodiagnostic techniques and advanced experimental life cycle studies using both living and preserved materials.
Prerequisites: None
Offered: Every year, Spring

BMS 532. Histology and Lab. 4 Credits.
This course is intended for pathologists' assistant students with a background in basic descriptive microscopic anatomy. The lecture material includes the microscopic and ultramicroscopic structure of cells, tissues and organs with emphasis on biochemical composition and distribution as related to functional mechanisms. The laboratory work involves the preparation of microscope slides of normal vertebrate tissues, including those of humans, for histological and histochemical studies as the student may expect to encounter in the clinical laboratory.
Prerequisites: None
Offered: Every year, Fall

BMS 535. Histochemistry and Lab. 3 Credits.
This course is intended for pathologists' assistant students with a background in basic descriptive microscopic anatomy. The lecture material includes the microscopic and ultramicroscopic structure of cells, tissues and organs with emphasis on biochemical composition and distribution as related to functional mechanisms. The lab work involves the preparation of microscope slides of normal vertebrate tissues, including those of humans for histological and histochemical studies as the student may expect to encounter in the clinical laboratory.
Prerequisites: None
Offered: Every year, Spring

BMS 536. Endocrinology. 3 Credits.
This course introduces students to 1) an intensive understanding of the mechanism of hormone action; 2) the importance of the interrelationship among all hormones; 3) a detailed clinical situation dealing with hormonal aberrations; and 4) a theoretical and practical method for hormone assays.
Prerequisites: None
Offered: As needed

BMS 552. Toxicology. 3 Credits.
Biochemical toxicology is the branch of science that deals with events at the molecular level in which toxic compounds interact with living organisms. It is fundamental to the understanding of toxic reactions and therapeutic agents, and for the assessment of toxic hazards by chemicals and related substances in the environment. This course deals with compounds exogenous to normal metabolism, as well as metabolic intermediates, hormones, trace elements and other materials found in the environment. It examines the absorption, distribution, kinetics and elimination of such substances. Particular emphasis is placed upon the effects of toxic materials on neurotoxicity, hepatotoxicity, genetic toxicology and chemical carcinogenesis.
Prerequisites: None
Offered: As needed

BMS 556. Seminar in Health Care Disparities. 1 Credit.
The Centers for Disease Control and Prevention (CDC) defines health disparities as differences in health outcomes between various segments of the population, which are mostly associated with socioeconomic status, race/ethnicity and level of education. This course investigates the cause and effect of health care disparities using an interdisciplinary approach. Students become familiar with the research literature on the topic from different points of view by being part of a literature review/journal club.
Prerequisites: None
Offered: As needed

BMS 561. Immunohematology. 3 Credits.
This course examines the current concepts of hematopoiesis, including red blood cell and white blood cell morphogenesis, blood banking, blood typing, donor selection, adverse transfusion reactions, ABO antigens/antibodies, crossmatching, the structure and function of the components of normal blood and bone marrow, pathological processes that occur in the blood and bone marrow, and the normal and abnormal events during hemostasis.
Prerequisites: None
Offered: As needed

BMS 562. Blood Coagulation and Hemostasis. 3 Credits.
This study of the basic principles of hemostasis includes the vascular component, platelet physiology and function, coagulation factors/fibrin clot formation and fibrinolysis. Hereditary and acquired forms of hemorrhagic disorders and thromboembolic disease are examined in detail along with the test procedures for their diagnoses and the initiation of proper therapy.
Prerequisites: None
Offered: As needed

BMS 563. Anemias. 3 Credits.
This study of those classes of disorders related to abnormal red cell pathophysiology includes both intracorpuscular and extracorpuscular defects. Erythropoiesis and basic red cell metabolism are briefly reviewed. Etiologies, differential diagnoses, and treatment of anemias are discussed in-depth.
Prerequisites: None
Offered: As needed

BMS 564. Fundamentals of Oncology. 4 Credits.
This course presents a study of the chemical and biological basis of carcinogenesis, natural history of human cancer, biochemistry of cancer, various aspects of experimental oncology including tumor immunology, and factors affecting survival and multiplication of cancer cells in the body. Delivery methods include weekly discussions on original research papers that correlate clinical studies with the molecular mechanisms presented in lecture.
Prerequisites: None
Offered: Every year, Spring

BMS 565. Leukemia. 3 Credits.
This course includes in-depth discussions with emphasis on the major forms of leukemia (ALL, CLL, AGL, CGL), current methods of blood component therapy and chemotherapy, the role of infections, immunological diagnostic advances, psychiatric and social aspects in patient management and recent advances in leukemia research. The purpose of the course is to enhance knowledge and understanding of those students who have had an introductory course in hematology and those who are actively involved in clinical or research hematological laboratories.
Prerequisites: None
Offered: As needed

BMS 569. Antimicrobial Therapy. 3 Credits.
This graduate-level course explores the antimicrobial agents used to treat infectious diseases by inhibiting microbial growth and survival. This interactive, discussion-based class investigates the history, current status and future directions of antimicrobial drugs with an emphasis on antibacterial and antiviral chemotherapeutic agents. Topics include the mode of action and efficacy of drugs, as well as the development, spread and mechanisms of drug resistance. Upper-level undergraduates may take this course with permission.
Prerequisites: None
Offered: Every year, Summer

BMS 570. Virology. 4 Credits.
This course presents a study of human and animal viruses, viral diseases, biochemical properties, and classification methods of isolation and identification of viral agents; preparation and inoculation of tissue culture, animals and embryonated eggs, immunological techniques, and antiviral chemotherapy.
Prerequisites: None
Offered: Every year, Spring

BMS 571. Human Anatomy & Dissection. 4 Credits.
This course is a regional-based approach to the study of human anatomy utilizing cadaver dissection, with an introduction to histology, embryology, neuroanatomy, and medical imaging. Through the combination of engaging lectures and immersive laboratory sessions, students will develop a profound understanding of the relationship between structural and its functional significance.
Prerequisites: None
Offered: Every year, All

BMS 572. Pathogenic Microbiology. 4 Credits.
This graduate microbiology course involves the study of medically important microbes, with a particular emphasis on the pathology associated with human infection. Students examine the underlying principles of microbial pathogenesis, including elements of structural biology, epidemiology, immunology and pathology. They also survey microbial organisms that plague mankind today.
Prerequisites: None
Offered: Every year, All

BMS 573. Mycology. 3 Credits.
The morphology, taxonomy and classification of fungi and yeasts of medical importance are studied in this class. Laboratory exercises include isolation and identification techniques of selected human pathogens.
Prerequisites: None
Offered: As needed

BMS 575. Food Microbiology. 4 Credits.
This applied course in microbiology is concerned with the microorganisms involved in the manufacture and spoilage of foods. Major pathogens that may be transmitted via foods are discussed. Laboratory stresses both identification of food-associated organisms and standard microbiological procedures used to determine the quality and safety of foods. Upper-level undergraduates may take course with permission.
Prerequisites: None
Offered: As needed

BMS 576. Drug Discovery and Development. 3 Credits.
The material presented in this course encompasses the process of drug discovery and development. Topics covered include many aspects of drug development such as target identification, evaluation and screening, all phases of clinical development and post-marketing activities. The material presented is across drug classes, with a particular focus on psychoactive and neurology compounds.
Prerequisites: None
Offered: Every year, Fall

BMS 577. Critical Analysis and Reasoning In the Biomedical Sciences. 2 Credits.
This course helps develop skills necessary for critical analysis and reasoning. This course covers inconsistencies, biases, and fallacies in reasoning and analysis vital for research/science/healthcare careers as well as MCAT and other exam preparation. Students will: examine how they think while reading and discussing clinical & research literature, learn to analyze readings and data by examining and practicing logical reasoning, and build evaluations and analyzing readings to ask and answer questions and build testable hypotheses.
Prerequisites: None
Offered: Every year, Spring

BMS 578. Cellular Basis of Neurobiological Disorders. 3 Credits.
A detailed overview of neurobiological disorders at the molecular level is presented. Recent advances in gene cloning to identify causes for some of these disorders are discussed in detail.
Prerequisites: None
Offered: As needed

BMS 579. Molecular Pathology. 3 Credits.
Molecular pathology is a new and rapidly growing discipline of laboratory medicine and includes applications of molecular techniques to all facets of diagnostic medicine. This course reviews the structure and function of nucleic acid sequences and provides an in-depth introduction to the molecular techniques exploited in the diagnosis of human diseases. The course focuses on currently employed applications to areas such as genetic disease, infectious disease, cancer and identity testing.
Prerequisites: None
Offered: As needed

BMS 583. Forensic Pathology. **3 Credits.**
This course is designed for students interested in the practical applications of science, specifically forensic medicine. Graphic examples of injuries and patterns of trauma serve as the backdrop for introduction to the understanding of the techniques involved in death investigation from the medical perspective.
Prerequisites: None
Offered: As needed

BMS 584. Emerging and Re-emerging Infectious Diseases. **3 Credits.**
This graduate-level course discusses current topics related to the plethora of infectious agents that besiege us. Emerging bacterial, protozoal and viral diseases, whether strictly animal or human or zoonotic pathogens, represent an increasing threat to animal and human health. The course examines, defines and discriminates between emerging, re-emerging and other infectious diseases; defines host and agent characteristics and risk factors; and analyzes social, economic and international trade changes, improper use of antibiotics, and multidrug resistant infectious agents as factors of emerging diseases. Upper-level undergraduates may take this course with permission.
Prerequisites: None
Offered: Every other year, Fall

BMS 585. Outbreak Control. **3 Credits.**
An outbreak or epidemic is the occurrence of more cases of disease than expected in a given area or among a specific group of people over a particular period of time. Usually, the cases are presumed to have a common cause or to be related to one another in some way. Public health agencies must decide whether to handle outbreaks without leaving the office, or spend the time, energy and resources to conduct field investigations. The most important reason to investigate is to learn enough about the situation to implement appropriate control and prevention measures. Investigations also enable researchers to advance knowledge about the disease, agent, risk factors and interventions; provide a way to respond to public, political or legal concerns; evaluate a health program's effectiveness and weaknesses; and provide training. When multiple agencies are involved in the investigation, coordination and communication become even more essential. Upper-level undergraduates may take this course with permission.
Prerequisites: None
Offered: Every other year, Fall

BMS 589. Independent Study. **1-6 Credits.**
Prerequisites: None
Offered: As needed

BMS 591. The New Genetics and Human Future. **3 Credits.**
We are the first creatures on Earth learning a 3.5-billion-year-old DNA language. The completion of the Human Genome Project and the emerging science of genomics has dramatic ethical, legal and social implications. New genetics have the potential to affect all spheres of human life, including the ability to construct our destiny as a species. The goal of the course is not to give the answers to the numerous questions and dilemmas of our exciting and controversial future but to inspire interest and desire to pursue more study.
Prerequisites: None
Offered: Every year, Spring

BMS 595. Transplantation Immunology. **3 Credits.**
This course examines the current understanding of the major histocompatibility complex; the molecular basis of alloreactivity; and immunological mechanisms of allograft rejection, tolerance, and graft versus host disease. The objectives are: to understand the basics of the histocompatibility complex in relation to normal, disease and transplantation states, to understand the fundamental differences between immune responses to self antigens, foreign antigens, allo-antigens, and other non-self antigens, and to become familiar with the mechanisms underlying successful allogeneic transplantation and appreciate the concepts of immunosuppression and tolerance. Graduate level students are expected to complete a paper reviewing a current topic in transplantation. A basic understanding of immunology is desirable. Upper-level undergraduates may take course with permission.
Prerequisites: None
Offered: Every other year, Fall

BMS 597. Biomedical Sciences Internship. **4 Credits.**
Students partake in a full-time professional work experience with a sponsoring organization. The experience brings together theory, application and current practice in the translational sciences. Journaling and discussion boards provide students with a reflective and intentional assessment of the field, their work and career development. Students submit a paper describing their experimental aims, design and outcomes as well as present their findings as a seminar open to the general university public.
Prerequisites: None
Offered: Every year, Summer

BMS 598. Synaptic Organization of the Brain. **3 Credits.**
Students study a variety of brain regions from both an anatomic and physiologic viewpoint to learn how these structures are organized at the synaptic level. The course includes a discussion of how these regions are associated with neurological disease. At the end of the class, students should: 1) understand the basic principles of neuronal functioning at the cellular and circuit level; 2) understand how the wide diversity of neural circuits seen in the brain generate specific functions in different regions; and 3) gain experience reading and interpreting scientific papers.
Prerequisites: None
Offered: As needed

BMS 599. Biomarkers. **3 Credits.**
Technological advances in molecular biology have provided an opportunity to evaluate drug-disease relationships at the molecular and cellular level. The goal of this course is to introduce the concept of biomarkers and how they are used clinically. This course covers both theoretical concepts and practical applications of biomarkers. Topics include the rationale for biomarkers, study design, logistics of sample collection/storage, options and techniques for analysis, as well as current applications in health care, including drug safety, regulatory issues, ethical considerations and the future direction of biomarker applications.
Prerequisites: None
Offered: Every year, Spring

BMS 622. MED Cross-Listed Selective. **3 Credits.**
BMS course to be cross-listed with a MED Course.
Prerequisites: None
Offered: Every year, All

BMS 650. Thesis I. 4 Credits.
Approval of one of the two thesis options-experimental laboratory research or nonlaboratory-based project-is required. The thesis topic may be handled as an original investigation or as an applied problem (e.g., clinical) so long as it is about a health-related problem. Typed copies of final draft, prepared in compliance with thesis-writing manual, must be submitted prior to issuance of diploma. Thesis projects must be completed within three years after registration for the thesis course.
Prerequisites: None
Offered: As needed

BMS 651. Thesis II. 4 Credits.
Approval of one of the two thesis options-experimental laboratory research or nonlaboratory-based project-is required. The thesis topic may be handled as an original investigation or as an applied problem (e.g., clinical) so long as it is about a health-related problem. Typed copies of final draft, prepared in compliance with thesis-writing manual, must be submitted prior to issuance of diploma. Thesis projects must be completed within three years after registration for the thesis course.
Prerequisites: None
Offered: As needed

BMS 670. Comp Exam/Biomedical Sciences. 2 Credits.
The comprehensive examination is a requirement of the non-thesis option of the Biomedical Sciences program. The purpose of the exam is twofold. First, it ascertains if the student possesses both the broad and specific knowledge expected of someone holding a master's degree. Second, it inquires if the student has been able to integrate knowledge obtained from individual courses into unified concepts that link the student's own specialization to other fields of study. A written essay exam is administered and graded by the exam course committee or individual faculty. Students should schedule an appointment with the program director before registering for the comprehensive exam course.
Prerequisites: None
Offered: As needed

BMS 681. Research Methods in Biomedical Sciences I. 1-4 Credits.
Students learn the basic principles of research methodology. Register by paper with your mentor.
Prerequisites: None
Offered: Every year, Fall and Spring

BMS 688. Independent Study. 1-6 Credits.
Prerequisites: None
Offered: As needed

BMS 689. Independent Study. 1-4 Credits.
Prerequisites: None
Offered: As needed