

BACHELOR OF SCIENCE IN MEDICAL MICROBIOLOGY AND IMMUNOLOGY

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Rapid and expanding advances in the field of medical microbiology and immunology have created a need for employees with expertise in a variety of areas. Our graduates are prepared for exciting careers in the expanding medical, clinical, pharmaceutical, biotechnological, molecular and health industries. This program also prepares the student for advanced study in specialized graduate science, health and medical programs.

The program offers students a range of classroom, laboratory and independent research experiences. All courses consist of lecture and hands-on laboratories where students perform the most current research techniques. In addition to courses in the sciences, the University Curriculum (<http://catalog.qu.edu/academics/university-curriculum/>) course offerings prepare students with a broad-based conceptual understanding of science and its role in society.

Included in this program is a two-semester required undergraduate seminar and research experience performed with faculty in research laboratories. This experience allows the student to develop the expertise and experience to be successful in beginning a career or in graduate study. All of our students give formal presentations of their independent research projects. Many have presented the results of research experiences at professional scientific meetings.

Successful third- and fourth-year students may be able to obtain internships or part-time work experiences during the school year and/or summer in government labs and major pharmaceutical or biotechnology companies located in the region. To remain in good standing within the program, the student must maintain a math and science GPA of 2.25.

The BS in Medical Microbiology and Immunology program requires 120 credits for degree completion.

Code	Title	Credits
University Curriculum (http://catalog.qu.edu/academics/university-curriculum/)¹		46
Foundational Math & Science		
BIO 150 & 150L	General Biology for Majors and General Biology for Majors Laboratory ¹	
BIO 151 & 151L	Molecular and Cell Biology and Genetics and Molecular and Cell Biology and Genetics Lab ¹	
CHE 110 & 110L	General Chemistry I and General Chemistry I Lab ¹	
CHE 111 & 111L	General Chemistry II and General Chemistry II Lab	4
CHE 210 & 210L	Organic Chemistry I and Organic Chemistry I Lab	4
CHE 211 & 211L	Organic Chemistry II and Organic Chemistry II Lab	4

CHE 315 & 315L	Biochemistry I and Biochemistry I Lab	4
PHY 110 & 110L	General Physics I and General Physics I Lab ¹	4
PHY 111 & 111L	General Physics II and General Physics II Lab ¹	4
MA 140	Pre-Calculus ^{1,2}	

Microbiology Core Requirements 14

BMS 370 & 370L	General Microbiology and General Microbiology Lab	
BMS 372 & 372L	Pathogenic Microbiology and Pathogenic Microbiology Lab	
BMS 375 & 375L	Immunology and Immunology Lab	
BMS 478	Microbiology Seminar	
BMS 483	Independent Study in Microbiology	

Microbiology and Science Electives^{3,4} 12

BMS 275	Introduction to Biomedical Research	
BMS 299	Biomedical Sciences Journal Club	
BMS 312	Biomedical Genomics	
BMS 319	Public Health: Epidemiology of Infectious Diseases	
BIO 215	Environmental Biotechnology	
BMS 373	Mycology	
BIO 346 & 346L	Cell Physiology and Cell Physiology Lab	
BMS 470	Virology	
BMS 471	Human Anatomy & Dissection	
BMS 472	Biotechnology	
BMS 473	Infections of Leisure	
BMS 474	Power of Plagues	
BMS 475	Special Topics in Microbiology	
BMS 477	Critical Analysis and Reasoning In the Biomedical Sciences	
BMS 481	Research Techniques in Biomedical Sciences	
BMS 482	Independent Study in Microbiology	

Immunology Electives 3

BMS 319	Public Health: Epidemiology of Infectious Diseases	
BMS 331	Clinical Immunology	
BMS 378	Vaccines and Vaccine-Preventable Diseases	
BMS 473	Infections of Leisure	
BMS 474	Power of Plagues	
BMS 482	Independent Study in Microbiology	

Science Electives 11

Select additional credits from any BMS, HSC, BIO, CHE, PHY course at the 200 level or above

Open Electives 10

Complete additional courses to meet the 120 credit requirement

Total Credits 120

¹ Major courses may double count with UC courses, consult with your advisor.

² Minimum mathematics requirement: MA 140. For those interested in graduate or professional schools, MA 141 is recommended.

³ BIO 471 and BMS 470 strongly recommended.

⁴ Additional electives and graduate courses may be selected with the approval of the Chair or Program Director.

This is an *example* plan of study and would be modified for each student to accommodate academic interests, post-graduate goals and choice of minor or pre-graduate/pre-health preparation. Course availability, potential transfer credits, and course prerequisite completion may influence the final course schedule for each program.

Course	Title	Credits
First Year		
Fall Semester		
FYS 101	First-Year Seminar (UC Foundations Inquiry)	3
EN 101	Introduction to Academic Reading and Writing (UC First Year Writing)	3
BIO 150 & 150L	General Biology for Majors and General Biology for Majors Laboratory	4
CHE 110 & 110L	General Chemistry I and General Chemistry I Lab (UC Natural Science with Lab)	4
MA 141	Calculus of a Single Variable (UC Personal Inquiry 2)	3
Credits		17
Spring Semester		
CHE 111 & 111L	General Chemistry II and General Chemistry II Lab	4
BIO 151 & 151L	Molecular and Cell Biology and Genetics and Molecular and Cell Biology and Genetics Lab	4
EN 102	Academic Writing and Research (UC First Year Writing)	3
PS 101	Introduction to Psychology	3
BMS 275	Introduction to Biomedical Research	2
Credits		16
Second Year		
Fall Semester		
BMS 370 & 370L	General Microbiology and General Microbiology Lab	4
CHE 210 & 210L	Organic Chemistry I and Organic Chemistry I Lab	4
HS 282	Global Environmental History	3
MA 285	Applied Statistics	3
Credits		14
Spring Semester		
BMS 372 & 372L	Pathogenic Microbiology and Pathogenic Microbiology Lab	4
CHE 211 & 211L	Organic Chemistry II and Organic Chemistry II Lab	4
BIO 471 & 471L	Molecular Genetics and Molecular Genetics Lab	4

AR 241	Color Theory	3
BMS 482	Independent Study in Microbiology	1
Credits		16
Third Year		
Fall Semester		
BMS 375 & 375L	Immunology and Immunology Lab	4
BIO 346 & 346L	Cell Physiology and Cell Physiology Lab	4
PHY 110 & 110L	General Physics I and General Physics I Lab	4
ARB 210	Arab Culture and Society	3
BMS 481	Research Techniques in Biomedical Sciences	1
Credits		16
Spring Semester		
BMS 472	Biotechnology	4
PHY 111 & 111L	General Physics II and General Physics II Lab	4
CHE 315 & 315L	Biochemistry I and Biochemistry I Lab	4
BMS 483	Independent Study in Microbiology	1
PS 272	Psychopathology	3
Credits		16
Fourth Year		
Fall Semester		
BMS 470	Virology	4
BMS 478	Microbiology Seminar	1
BMS 319	Public Health: Epidemiology of Infectious Diseases	3
BMS 312	Biomedical Genomics	3
CHE 215 & 215L	Analytical Chemistry and Analytical Chemistry Lab	4
Credits		15
Spring Semester		
SHS 420	Integrative Capstone	3
BMS 378	Vaccines and Vaccine-Preventable Diseases	3
BIO 328 & 328L	Human Clinical Parasitology and Human Clinical Parasitology Lab	4
ENV 225	Water and Human Health	3
Credits		13
Total Credits		123

Student Learning Outcomes

Upon completion of the medical microbiology and immunology program, students will demonstrate the following competencies:

- Core Disciplines:** Demonstrate advanced knowledge of the foundational principles in the disciplines of biology, chemistry and physics.
- Advanced Knowledge:** Demonstrate advanced knowledge of the fundamental concepts of microbiology and immunology.
- Organisms and Host:** Understand the symbiotic relationships that can exist between microorganisms and humans (mutualistic, commensal and pathogenic).

4. **Professional Skills:** Master the essential technical and analytical skills of the microbiologist/immunologist.
5. **Effective Scientist:** Engage in scientific research and effectively communicate the dissemination of results to various audiences.
6. **Responsible Citizen:** Evaluate the social and ethical impact of scientific discoveries on medical practice.

Mission Statement

The mission of the Medical Microbiology and Immunology degree program is to provide students with a solid basic science foundation in preparation for studying the upper-level sciences related to immunology and microbiology. This is meant to provide many opportunities to students who are interested in pursuing graduate programs (MS/PhD) in the micro-biological sciences (e.g., bacteriology, virology, public health, etc.), as well as sciences related to immunology (e.g., vaccines, epidemiology, cancer biology, etc.).

Additionally, students may pursue one of the medical-related professions (e.g., physician, physician assistant, dentist, veterinarian, pharmacist, chiropractor, etc.). Students who choose not to go on to graduate or professional school are able to apply for research and development positions in pharmaceutical and biotechnology companies.

Students learn about molecular biology with hands-on student-directed laboratory projects where thinking, planning and problem-solving skills are developed. Independent research projects under the guidance of faculty allow development of these skills with “real-world” experiences.

Student skills are evaluated continuously with written and oral presentations, encouraging the refinement of communication skills critical to a successful career. Products of student research activity are presented in seminars and at regional or national scientific meetings.

Admission

Admission into the Medical Microbiology and Immunology program is dependent on the applicant's potential to pursue a university program and on past academic performance. The high school student applying for admission into the Medical Microbiology and Immunology program should have a strong background in the biological sciences. To remain in good standing within the program, the student must maintain a math and science GPA of 2.25.

Transfer Students from within Quinnipiac University

Students currently attending Quinnipiac University in another program may be accepted into the Medical Microbiology and Immunology program based upon a review of qualification by the program director. Students may apply upon completion of at least one semester at Quinnipiac University. Students transferring in as a junior (i.e., 57 credits or more) must have completed both the general biology requirements, specifically, 8 credits of BIO 101 & BIO 102 or BIO 150 & BIO 151, and the general chemistry requirements, specifically, 8 credits of Quinnipiac's CHE 110 & CHE 111, prior to entry into the upper-class component of the program. Student also must meet the performance standards of the program (minimum math and science GPA of 2.25).

Transfer Students from Other Colleges and Universities

Transfer students from other colleges and universities may be accepted into the Medical Microbiology and Immunology program. These students must meet the program's performance standards and course requirements. For all transfer students, a minimum GPA of 2.67 is required. Students transferring in as a junior (i.e., 57 credits or more) must have completed both the general biology requirements, specifically, the equivalent of 8 credits of Quinnipiac's BIO 101 & BIO 102 or BIO 150 & BIO 151, and the general chemistry requirements, specifically, the equivalent of 8 credits of Quinnipiac's CHE 110 & CHE 111, prior to entry into the upper-class component of the program. Transfer students wishing to enter this program will be given appropriate transfer credit for previous college work.

BMS 110. The World of Microbes. 3 Credits.

In this course, which is designed for nonscience majors, students are introduced to the relevance of microorganisms in everyday life. Topics include: microbes in the environment, infectious disease, biotechnology, food microbiology, antibiotics and host defense mechanisms (e.g., the immune system). This course must be taken in association with BMS 110L.

Corequisites: Take BMS 110L.

Offered: As needed

BMS 117. The Human Organism. 3 Credits.

This course, designed for nonscience majors, emphasizes the human organism from a basic biological and developmental perspective. These concepts are explored by examining the development of the total human organism beginning with conception and onward into old age and eventual death. This course must be taken in conjunction with BMS 117L, the laboratory component of this course.

Corequisites: Take BMS 117L.

Offered: Every year, Fall and Spring

UC: Natural Sciences

BMS 117L. The Human Organism Lab. 1 Credit.

This lab, which accompanies BMS 117, The Human Organism, includes exercises/experiments designed to reinforce basic biological principles, which form the basis for understanding the biology of all organisms, including the human organism. This course must be taken in conjunction with BMS 117 lecture.

Corequisites: Take BMS 117.

Offered: Every year, Fall and Spring

UC: Natural Sciences

BMS 162. Human Health and Disease. 3 Credits.

This course, which is designed for nonscience majors, describes human disease from a biological viewpoint, and presents human health concerns and issues for discussion. Historical and sociological perspectives on human disease as well as the scientific investigation of disease processes are included. The role of molecular biology and biotechnology in approaching human disease is discussed.

Prerequisites: None

Offered: Every year, Fall and Spring

UC: Natural Sciences

BMS 200. Biomedical Basis and Experience of Human Aging. 3 Credits.

Key concepts of this course include: 1) the natural decline in human capabilities and function; 2) significant elder diseases; 3) elder health care issues; 4) factors that affect aging rates; and 5) death and dying. The course begins with concepts including research techniques, cellular aging and demographics. The second half focuses on the organ systems significantly affected in aging including skin, bones, muscle, the senses, the cardiovascular system and the nervous system.

Prerequisites: Take 1 group; BIO 101, BIO 102 or BIO 150, BIO 151 or BMS 117, BMS 162.

Offered: Every year, Fall and Spring

UC: Natural Sciences, Intercultural Understand

BMS 213. Microbiology and Pathology. 3 Credits.

This introductory overview of microorganisms presents a detailed study of the interactions of pathogenic microbes and humans, particularly as they apply to a clinical setting; this course is designed primarily for the health practitioner. This course must be taken in conjunction with BMS 213L. Students may receive credit for BMS 213 or BMS 370, but not both.

Prerequisites: Take BIO 102 and BIO 102L or BIO 103 or BIO 104 and BIO 104L or BIO 151.

Corequisites: Take BMS 213L.

Offered: Every year, Fall and Spring

BMS 213L. Microbiology and Pathology Lab. 1 Credit.

This lab, which accompanies BMS 213 Microbiology and Pathology, includes exercises/experiments designed to cultivate basic microbiological techniques and reinforce important principles of general and clinical microbiology. This course must be taken in conjunction with BMS 213.

Corequisites: Take BMS 213.

Offered: Every year, Fall and Spring

BMS 221. Physiology and Effects of Obesity in Society. 3 Credits.

This course examines the physiology and effects of adult and childhood obesity, its development, prevention and treatment. The course also explores the impacts and consequences obesity has on the individual and society (both in the U.S. and globally).

Prerequisites: None

Offered: Every year, Fall

UC: Breadth Elective

BMS 275. Introduction to Biomedical Research. 2 Credits.

This course provides a broad, discussion-based investigation of topics in biomedical research, including basic research techniques, clinical trials, healthcare disparities, publishing data, and potential careers in the biomedical sciences. Students also will be introduced to techniques for analyzing research data, reading scientific literature, and communicating scientific concepts to different populations. This interactive course helps prepare students for independent research projects at Quinnipiac University, graduate/professional programs and careers in the biological, biomedical or health sciences.

Prerequisites: Take BIO 150 or BIO 101 and BIO 101L with instructor permission or BIO 103 with instructor permission.

Offered: Every year, Spring

BMS 276. Drug Development. 3 Credits.

In this course, students study the processes required to develop new drugs, as well as the regulations associated with drug development. Topics include drug discovery, preclinical and clinical testing of drugs, pharmacoeconomics and legislation associated with drug development. Specific therapeutic drug examples are discussed throughout the course.

Prerequisites: Take BIO 101, BIO 101L and BIO 102, BIO 102L or BIO 150, BIO 151 or BMS 117, BMS 162 or BIO 105, BIO 106.

Offered: Every year, Fall and Spring

BMS 299. Biomedical Sciences Journal Club. 1 Credit.

This course follows the structure of a traditional journal club. Each week, students present the background, content, and the scientific/social implications of a peer reviewed paper in the translational sciences to their peers. Students not presenting are expected to actively participate in a group discussion. This course focuses on advancing students' scientific knowledge and developing effective oral and written communication skills. This course may be repeated for up to 3 credits.

Prerequisites: Take BIO 102 or BIO 151.

Offered: Every year, Fall

BMS 300. The Physiology of Human Performance I. 3 Credits.

This course presents a detailed examination of muscle and nerve physiology, and central nervous system control of posture and locomotion. Bioenergetics and exercise metabolism are considered.

Anatomical and physiological factors limiting various types of physical performance are discussed. Full-year course; must be taken in sequence. This course must be taken in conjunction with BMS 300L.

Prerequisites: Take BIO 212 and CHE 102, CHE 102L or CHE 111, CHE 111L.

Offered: Every year, Fall

BMS 300L. The Physiology of Human Performance I Lab. 1 Credit.

(3 lab hrs.) Laboratory exercises/experiments are designed to reinforce basic principles of physiology examined in lecture. This course must be taken in conjunction with BMS 300 lecture.

Corequisites: Take BMS 300.

Offered: Every year, Fall

BMS 301. Physiology of Human Performance II. 3 Credits.

This course presents a detailed examination of cardiorespiratory and thermoregulatory responses to exercise. Body composition and diet/nutrition are considered. Anatomical and physiological factors limiting various types of physical performance are discussed. Full-year course; must be taken in sequence. This course must be taken in association with BMS 301L.

Prerequisites: Take BMS 300, BMS 300L.

Corequisites: Take BMS 301L.

Offered: Every year, Spring

BMS 301L. Physiology of Human Performance II Lab. 1 Credit.

Lab to accompany BMS 301 (3 lab hrs.) Laboratory exercises/experiments are designed to reinforce basic principles of physiology examined in lecture. This course must be taken in association with BMS 301.

Prerequisites: Take BMS 300.

Corequisites: Take BMS 301.

Offered: Every year, Spring

BMS 302. Human Performance and Exercise Physiology. 3 Credits.

This course explores the physiological adaptations of the human body to exercise, focusing on bioenergetics and the circulatory, respiratory, and neuromuscular systems. Students will learn how acute and chronic exercise impacts metabolism, circulation, and structural adaptations, with discussions on environmental factors and ergogenic aids. Emphasizing practical application, the course is designed for students in physical education, coaching, athletic training, or healthcare, providing essential knowledge on the body's response to exercise for their respective fields.

Prerequisites: Take BIO 212 and CHE 102, CHE 102L or CHE 111, CHE 111L.

Offered: Every year, Fall and Spring

BMS 304. Biological Chemistry. 3 Credits.

This course, which is designed for ELMPA & HSC majors, is a comprehensive study of contemporary biochemistry for pre-health students. The fundamental chemical and physical principles that underlie living processes are examined with an emphasis on the chemical structure and biological function. Medical and clinical perspectives relate the chemistry to health concerns and/or diagnostic applications. Students who have completed CHE 315 are not eligible to take this course. This course will not fulfill the requirements for the pre-medical studies designation.

Prerequisites: Take BIO 102, BIO 102L or BIO 151; and BIO 212, BIO 212L, CHE 111, CHE 210.

Offered: Every year, Fall and Spring

BMS 310. Neuroanatomy. 3 Credits.

This course offers students a detailed study of the fine and gross anatomy of the central nervous system. Major structures and landmarks within each major brain vesicle and spinal cord are discussed using clinical examples and neuroimaging.

Prerequisites: Take BIO 102, BIO 102L or BIO 103 or BIO 151

Offered: Every other year, Fall

BMS 312. Biomedical Genomics. 3 Credits.

The field of genomics has evolved tremendously as well as its application in clinical and research settings. The advent of next generation sequencing technologies has enhanced not only the diagnostic landscape but also the interventions and therapeutic strategies employed for patients. This course highlights these exciting developments by exploring the technologies and genetic underpinnings of disease across clinical domains. An emphasis is placed on genes and variants that confer risk from a genetic counseling perspective.

Prerequisites: Take BIO 151 or BIO 102 or BIO 103.

Offered: Every year, Fall

BMS 318. Pathophysiology. 3 Credits.

This course takes a mechanistic approach to the regulation of function of organ systems to provide students with the underlying physiological concepts in the homeostasis of each system and its interrelationship to other systems, and the pertinent diseases that best exemplify the disarray of the controlling mechanism. Students learn a way of thinking that enables them to conceptualize clinical problems in relation to system functions.

Prerequisites: Take BIO 211, BIO 212

Offered: Every year, Fall and Spring

BMS 319. Public Health: Epidemiology of Infectious Diseases. 3 Credits.

This course provides an introduction to the application of epidemiological principles and practice to the study of infectious diseases. Students focus on the study of the frequency, distribution and determinants of infectious diseases of major public health importance. Emphasis also is placed on prevention methods and public health control efforts undertaken locally, nationally and internationally.

Prerequisites: Take BMS 213 or BMS 370.

Offered: Every year, Fall

BMS 320. Pharmacology. 3 Credits.

This course takes a physiological systems approach to the study of the major classes of drugs used in therapeutics. Each class of drugs is studied according to dose-response characteristics, mechanism of action, major physiological effects, toxicity and possible drug interaction.

Prerequisites: Take BIO 211, BIO 212.

Offered: Every year, Spring

BMS 325. Toxicology. 3 Credits.

Toxicology is the branch of science that investigates the complex interactions between exogenous chemicals and physical processes (e.g. radiation) with living organisms. This course entails an examination of the absorption, distribution, toxicokinetics, metabolism and elimination of exogenous substances from the body. Particular emphasis is placed on the effects of toxic agents on the following systems in humans: hepatobiliary, pulmonary, renal, nervous and reproductive. The role of toxic chemicals/physical agents in teratogenesis, mutagenesis and carcinogenesis also is studied.

Prerequisites: Take BIO 102, BIO 102L or BIO 151 and CHE 211.

Offered: Every year, Spring

BMS 330. 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: Take BIO 102, BIO 102L or BIO 151.

Offered: Every year, Fall

BMS 331. Clinical Immunology. 3 Credits.

This course examines the human immune system: innate, humoral, cellular, and adaptive immunity and how the cells differentiate self from non-self in order to prevent infection, cancer, disease and/or death, and autoimmunity. Students will discover why we are not sick all the time and how the immune system remembers "enemies" that it has seen in the past. This course has a clinical bent, with more of an emphasis on immunodeficiencies, immunopathologies, vaccinations and immunotherapies.

Prerequisites: Take 1 FROM BIO 102 BIO 102L OR BIO 103 OR BIO 151

Offered: Every year, Spring and Summer

BMS 332. Histology and Lab. 4 Credits.

This course is intended for senior ELMPA students. It entails the microscopic and ultra-microscopic study of the structure of cells, tissues and organs, and emphasizes their functional mechanisms. Students learn how to prepare and stain normal tissue slides for histological and histochemical study, and how to examine these prepared slides.

Prerequisites: Take BIO 211, BIO 212, CHE 210, CHE 211.

Offered: Every year, Spring

BMS 364. Molecular Mechanisms of Cancer Therapies. 3 Credits.

This course examines the cellular biology of cancer and the molecular mechanisms of cancer therapies. Students discuss both traditional and current treatment options, as well as future areas of cancer research and medicine. Students compare the use of generalized cancer therapies, tumor-targeted therapies, and upcoming therapies and their effect on patient prognosis.

Prerequisites: Take BIO 102, BIO 102L or BIO 151, BIO 151L, and CHE 102, CHE 102L or CHE 111, CHE 111L.

Offered: As needed, Spring

BMS 370. General Microbiology. 3 Credits.

This study of the biology of bacteria and other microorganisms includes the structural features, genetics, biochemistry, ecology and symbiotic relationships of microbes, with particular emphasis on the differences between unicellular microbes and multicellular organisms. Students may receive credit for BMS 370 or BMS 213, but not both. This course must be taken in conjunction with BMS 370L.

Prerequisites: Take BIO 101, BIO 102 or BIO 150, BIO 151; and CHE 110, CHE 111.

Offered: Every year, Fall and Spring

BMS 370L. General Microbiology Lab. 1 Credit.

In the laboratory component of General Microbiology, students master foundational microbiological techniques such as microscopy, staining and culture of microbes, and utilize these techniques to explore various properties of microbes relevant to clinical, industrial, environmental and household settings. Students also identify unknown bacteria using both biochemical assays and molecular techniques. Critical thinking is emphasized through a project-based inquiry approach. This course must be taken in conjunction with BMS 370.

Corequisites: Take BMS 370.

Offered: Every year, Fall and Spring

BMS 372. Pathogenic Microbiology. 3 Credits.

This course involves the study of medically important microbes.

Topics include the principles of microbial pathogenesis, host-microbe interactions and etiology of infectious disease. This course must be taken in conjunction with BMS 372L.

Prerequisites: Take BMS 370, BMS 370L.

Corequisites: Take BMS 372L.

Offered: Every year, Spring

BMS 372L. Pathogenic Microbiology Lab. 1 Credit.

The laboratory component of Pathogenic Microbiology includes laboratory exercises/experiments designed to reinforce the biochemical, serological and pathogenic characteristics of disease-producing microorganisms. Special emphasis is placed on techniques used to identify disease-causing microorganisms and differentiating them from closely related members of human indigenous microflora. This course must be taken in conjunction with BMS 372.

Prerequisites: Take BMS 370, BMS 370L.

Corequisites: Take BMS 372.

Offered: Every year, Spring

BMS 373. Mycology. 3 Credits.

The morphology, taxonomy and phylogeny of fungi are studied in this course. The laboratory companion to this course (BMS 373L) provides opportunities for culturing and performing biochemical analyses of selected fungi, including human pathogens. This course must be taken in conjunction with BMS 373L.

Prerequisites: None

Offered: As needed

BMS 373L. Mycology Lab. 1 Credit.

This lab accompanies BMS 373 Mycology and allows many opportunities for culturing and performing biochemical analyses of selected fungi, including human pathogens. This course must be taken in conjunction with BMS 373.

Prerequisites: None

Offered: As needed

BMS 375. Immunology. 3 Credits.

This course entails a study of the basic principles and regulatory mechanisms of the human immune response. Innate defenses along with cellular and humoral immune defense mechanisms are studied in detail. Abnormal immune system functions are explored via study of acquired and primary immunodeficiencies and autoimmune diseases. Vaccines and transplantation also are discussed. Students may receive credit for BMS 375 or HSC 375, but not both. Students withdrawing from either lecture or lab must withdraw from both. **Prerequisite:** BMS 370 (or BMS 213 with permission of the instructor); BMS majors must take BMS 375 and BMS 375L together.

Prerequisites: Take BMS 370, BMS 370L.

Corequisites: Take BMS 375L.

Offered: Every year, Fall

BMS 375L. Immunology Lab. 1 Credit.

The laboratory component of Immunology involves laboratory exercises/experiments designed to reinforce immunological concepts. Topics fundamental to both immunological research and clinical diagnostics are covered. Cellular-based and clinically relevant concepts are reinforced via hands-on immunological techniques, class discussions, presentations and case studies. Students withdrawing from either lecture or lab must withdraw from both. BMS majors must take BMS 375 and BMS 375L together.

Prerequisites: Take BMS 370, BMS 370L.

Corequisites: Take BMS 375.

Offered: Every year, Fall

BMS 378. Vaccines and Vaccine-Preventable Diseases. 3 Credits.

This course examines the current understanding of vaccinations, as well as the historical and current implication of vaccine-preventable diseases (VPDs). Students gain knowledge regarding VPDs and the childhood vaccination schedule. They gain an understanding of how vaccines work, why they are still necessary, and how to explain why they are safe. Emphasis is placed on the need to effectively communicate with the public regarding vaccine myths and misconceptions. Also included is a publicly disseminated "change the world" project. Students may only take one of the following for credit: BMS 378, HSC 378 or BMS 525.

Prerequisites: Take BMS 213, BMS 213L or BMS 370, BMS 370L.

Offered: Every year, Spring

BMS 397. Biomedical Sciences Internship. 1-4 Credits.

Students partake in a part-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 must submit a paper describing their experimental aims, design and outcomes, and also present their findings as a seminar or poster.

Prerequisites: Minimum GPA of 3.0, Permission of Department Chair.

Offered: As needed

BMS 470. Virology. 4 Credits.

This course covers the strategies employed by different virus families to infect host cells and replicate within them. This includes animal, plant and bacterial viruses. Topics include: viral structure, genetics, molecular mechanism of replication and host response to infection. Students also are exposed to standard research methodologies and cutting-edge research used in the field through reviews of current research articles.

Prerequisites: Take BMS 370, BMS 370L.

Offered: Every year, Fall

BMS 471. 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: Take BIO 102 or BIO 103 or BIO 104 or BIO 151, or senior status

Offered: Every year, All

BMS 472. Biotechnology. 4 Credits.

This laboratory course addresses the genetic manipulation and use of organisms (commonly genetically modified) in agriculture, transgenic animal formation and human gene therapy. Molecular diagnostics, gene cloning, and genetic analysis of single nucleotide polymorphisms (SNPs) and epigenetic markers are addressed with hands-on experiments. The course is designed for students interested in careers in medicine, or biomedical sciences and microbiology research and industry (4 lab hrs.).

Prerequisites: Take BMS 370, BMS 370L.

Offered: Every year, Spring

BMS 473. Infections of Leisure. 3 Credits.

This course looks at infectious hazards associated with a wide range of human leisure activities, from lazing on a beach to relaxing in a spa, dining out, or simply staying home and gardening. Participants discuss infections linked to salt and freshwater activities, camping and the outdoors, gardening, contact with animals, eating, foreign travel, sports, sexually transmitted diseases, body piercing, tattooing and trekking to high altitudes. Topics such as epidemiology, antibiotic resistance, pathogenicity, plagues and vaccines also are addressed. This course has social organization of the science of infectious diseases.

Prerequisites: Take BMS 370, BMS 370L or BMS 213, BMS 213L.

Offered: Every year, Fall

BMS 474. Power of Plagues. 3 Credits.

This course examines the impact of infectious diseases on humans—in the past, in the present and in the future. From the 14th-century plague to the current HIV/AIDS, diseases have fundamentally altered the shape of society, politics and culture. This class examines some important diseases, including their impact, pathogenicity, infectivity, epidemiology, consequences, costs and lessons learned. Diseases such as smallpox, polio, rabies, tuberculosis, cholera, bubonic plague, influenza, malaria, yellow fever, syphilis and AIDS are investigated. The impact of antibiotics, antibiotic resistance and nosocomial infections also is discussed.

Prerequisites: Take BMS 213, BMS 213L or BMS 370, BMS 370L.

Offered: Every year, Summer

BMS 475. Special Topics in Microbiology. 1-4 Credits.

The latest developments and concepts in the field of clinical and public health microbiology are introduced. Topics may include the oral microbiology, epidemiology of Streptococcal and Staphylococcal infections, antibiotic resistance, drug susceptibility testing, the bacteriology of the hospital environment, vaccine-preventable diseases or quality control in the clinical microbiology laboratory. Recommendation of BMS 213/370 lab instructor and permission of instructor needed. One lecture hour, one research meeting hour, one discussion hour and 4-10 lab hours.

Prerequisites: Take BMS 370, BMS 370L or BMS 213, BMS 213L.

Offered: Every year, All

BMS 477. 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: 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: Take BIO 151 or BIO 102 and instructor approval.

Offered: Every year, Spring

BMS 478. Microbiology Seminar. 1 Credit.

This course introduces students to the microbiology- and immunology-related literature required for the development, implementation and analysis of an independent research project in microbiology and immunology. For microbiology majors.

Prerequisites: Take BMS 370, BMS 370L.

Offered: Every year, Fall

BMS 479. Microbiology Research. 2 Credits.

Independent projects in selected areas of microbiology and biotechnology are completed under the direction of a faculty member. For microbiology majors.

Prerequisites: Take BMS 370, BMS 370L.

Offered: Every year, Fall and Spring

BMS 481. Research Techniques in Biomedical Sciences. 1-4 Credits.

Laboratory course designed around learning the basic principles of a research technique in the context of a faculty member's research. Learn how the method works, gain technical proficiency leading to independence, and practice professional scientific communication through analysis and interpretation of original data. Students interested in implementing these techniques in subsequent independent research, or who want to build their resumes with laboratory skills, are welcome. May be taken more than once for different techniques.

Prerequisites: None

Offered: Every year, Fall and Spring

BMS 482. Independent Study in Microbiology. 1-4 Credits.

This course consists of microbiology content not offered by another QU catalog course. It must involve contact hours and scholarly activities equivalent to any regularly offered course. This course often includes review of the scientific literature in the field of the research project and creating a "product," such as a term essay, a series of short papers, laboratory or project reports, a portfolio or presentation at a scientific meeting. Students cannot register online; registration is via a paper form only. BMS students may take up to 8 credits of BMS 482, BMS 483, BMS 498, BMS 499, HSC 498, HSC 499.

Prerequisites: None

Offered: Every year, Fall and Spring

BMS 483. Independent Study in Microbiology.**1-4 Credits.**

This course consists of microbiology content not offered by another QU catalog course. It must involve contact hours and scholarly activities equivalent to any regularly offered course. This course often includes review of the scientific literature in the field of the research project and creating a "product," such as a term essay, a series of short papers, laboratory or project reports, a portfolio or presentation at a scientific meeting. Students cannot register online; registration is via a paper form only. BMS students may take up to 8 credits of BMS 482, BMS 483, BMS 498, BMS 499, HSC 498, HSC 499.

Prerequisites: None**Offered:** Every year, Fall and Spring**BMS 498. Independent Study in Biomedical Sciences I.****1-4 Credits.**

This course consists of biomedical sciences content not offered by another QU catalog course. It must involve contact hours and scholarly activities equivalent to any regularly offered course. This course often includes review of the scientific literature in the field of the research project and creating a "product," such as a term essay, a series of short papers, laboratory or project reports, a portfolio or presentation at a scientific meeting. Students cannot register online; registration is via a paper form only. BMS students may take up to 8 credits of BMS 482, BMS 483, BMS 498, BMS 499, HSC 498, HSC 499.

Prerequisites: None**Offered:** As needed**BMS 499. Independent Study in Biomedical Sciences II.****1-4 Credits.**

This course consists of biomedical sciences content not offered by another QU catalog course. It must involve contact hours and scholarly activities equivalent to any regularly offered course. This course often includes review of the scientific literature in the field of the research project and creating a "product," such as a term essay, a series of short papers, laboratory or project reports, a portfolio or presentation at a scientific meeting. Students cannot register online; registration is via a paper form only. BMS students may take up to 8 credits of BMS 482, BMS 483, BMS 498, HSC 498, HSC 499.

Prerequisites: None**Offered:** As needed

Pre-Medical Studies

The Pre-Medical Studies Designation is designed for undergraduate students who are interested in pursuing doctoral or advanced professional degrees in medicine such as MD, DO, DDS/DMD, PharmD, OD, DPM, DPT or DVM and allows students to enroll in and track typical medical or professional school course requirements. Students in any major may pursue the Pre-Medical Studies designation. Interested students should refer to the Pre-Medical Studies page for more information.

Seamless Transfer Agreement with Gateway Community College (GCC), Housatonic Community College (HCC) and Norwalk Community College (NCC)

Under this Transfer Agreement, GCC, HCC and NCC graduates will be guaranteed admission into a bachelor's degree program with third year (junior) status at Quinnipiac University on the condition that they:

- Graduate with an associate in arts, an associate in science in business, College of Technology engineering science, nursing or an

allied health degree with a minimum cumulative GPA of 3.00 (this may be higher in specific programs).

- Satisfy all other Quinnipiac University transfer admission requirements and requirements for intended major.

Quinnipiac University agrees to accept the general education embedded in these associate degree programs in accordance with Quinnipiac preferred choices for general education as meeting all the requirements of its undergraduate general education except for the Integrative Capstone Experience and where courses are encumbered by the major (e.g., General Chemistry for the Disciplinary Inquiry Natural Science requirement for a Biochemistry major).

Suggested Transfer Curriculum for BS in Medical Microbiology and Immunology

A minimum of 60 credits is required for transfer into the BS in Medical Microbiology and Immunology program. Below is a sample plan of study for the first two years.

Course	Title	Credits
First Year		
Fall Semester		
English		3
General Biology with Lab		4
General Chemistry with Lab		4
Math - Precalculus		3
Credits		14
Spring Semester		
English II		3
General Biology II with Lab		4
General Chemistry II with Lab		4
Math - Calculus		3
Elective		3
Credits		17
Second Year		
Fall Semester		
Anatomy & Physiology I with Lab		4
General Physics with Lab		4
Elective		3
Elective		3
Credits		14
Spring Semester		
Anatomy & Physiology II with Lab		4
General Physics II with Lab		4
Microbiology with Lab		4
Elective		3
Credits		15
Total Credits		60