

MICROBIOLOGY AND IMMUNOLOGY (MICR)

MICR 121 Microbiology for Nursing Students Units: 3.00

This course provides the student with a foundation in the subdisciplines of bacteriology, virology, parasitology, and immunology. The course is designed to examine common infectious diseases through a body-systems approach. Laboratory and tutorial sessions emphasize diagnostic microbiology.

Requirements: BCHM010 OR BCHM102

Offering Faculty: Faculty of Health Sciences

MICR 221 Fundamental Microbiology Units: 3.00

A fundamental study of the structure, genetics, and growth of microorganisms, focusing on bacteria and viruses. The roles of microbes in the environments in which they exist will be considered.

Learning Hours: 120 (36 Lecture, 18 Laboratory, 66 Private Study)

Requirements: PREREQUISITE (A GPA of 1.90 (obtained in any term) or a `Pass; (obtained in Winter 2020) in BIOL 102/3.0 and BIOL 103/3.0) and CHEM 112/6.0.
EXCLUSIONS MICR 271/3.0

Course Equivalencies: MICR221, MICR229

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. understand the main ways bacteria exchange DNA
2. understand the major structures of bacterial cells, their functions and assembly;
3. recognize roles microbes play in the environment as well as in disease
4. appreciate the diversity of microbes
5. identify the growth phases of bacteria and how growth can be measured
6. understand the many ways microbes acquire nutrients from their environment
7. understand how bacteria communicate
8. understand the many ways bacteria regulate expression of their genes;
9. integrate lecture material with the lab component
10. identify major virus families and understand their structure, replication strategies and diversity
11. understand how viruses disseminate within the infected host organism and how they cause disease
12. understand how the host organism responds to virus infection and develops immunity to future infection by the same virus
13. understand the mechanisms by which some viruses evade host immune defenses
14. understand the challenges faced in the global delivery of vaccines to eradicate select viral pathogens.



MICR 270 Infection, Immunity and Inflammation Units: 3.00

This course focuses on 1) the overall organization of the immune system, 2) the role of the immune system in combating diseases caused by common pathogens as well as adverse reactions of the immune system and 3) application of the basic knowledge of immunology to the field of infectious disease prevention and control by vaccines and treatment of cancer. The unique features of this course lie in its overall structure and delivery that will prepare the student for further in-depth learning in the field of immunology. NOTE This online course in infection and immunity is designed for students from various biological sciences and allied health backgrounds at all levels of post-secondary education and is recommended as a foundation course for students pursuing a life sciences career.

NOTE Also offered online. Consult the Bachelor of Health Sciences program office.

NOTE May not be taken for credit towards the Plan requirements of the LISC Specialization or Major Plans.

Learning Hours: 114 (36 Online Activity, 78 Private Study)

Requirements: Minimum 2nd year (Level 2) standing and one of (BIOL 102/3.0; MICR 121/3.0; PHGY 170/3.0). One-way Exclusion May not be taken with or after MICR 360/3.0; MICR 386/3.0; BMED 386.

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Describe the beneficial and detrimental interactions of the innate and adaptive branches of the human immune system.
2. Describe the organization of the immune system and how it functions.
3. Describe the unique features of human defense mechanisms against microbial agents.
4. Understand how the basic knowledge of immunology can be applied and translated to the development of immunological techniques, vaccines, and cancer immunotherapies.

MICR 271 Introduction to Microbiology Units: 3.00

An introduction to the biology of microbes, including both pathogenic & beneficial bacteria, viruses, fungi, & protozoa. This overview of the biological features of these microorganisms will highlight these organisms' roles in the environment & in human health contributing to infectious diseases vs. maintaining healthy microbiomes.

NOTE Only offered online. Consult the Bachelor of Health Sciences Program office.

Learning Hours: 120 (60 Online Activity, 60 Private Study)

Requirements: Minimum 2nd year (Level 2) standing and one of (PHGY 170/3.0; BIOL 102/3.0). Exclusion MICR 221/3.0

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Analyze information pertaining to a specific organism to evaluate the impact of microbial replication, gene expression and antibiotic resistance of the microorganism in health, disease or the environment.
2. Collaboratively demonstrate a working knowledge of microbe characteristics that relate to their survival by working effectively with peers.
3. Employ a basic understanding of the biological features of bacteria, viruses, and eukaryotic microbes to transition to higher level microbiology courses.
4. Employ effective peer review in a small group setting in order to collaboratively formulate predictions of the success or failure of designed superbugs.

MICR 290 Antibiotic Resistance Lab Units: 3.00

This immersive laboratory course is designed to give students the opportunity to apply important microbiological and biochemical research techniques to the study of antibiotic resistance. Students work in small groups on a semester-long project, developing valuable lab skills that will support them with future research opportunities.

Learning Hours: 120 (36 Laboratory, 48 Online Activity, 36 Private Study)

Requirements: Prerequisite Level 2 or above and registration in a BCHM or LISC Plan, or BHSc Program, and (BIOL 102/3.0 or PHGY 170/3.0).

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Recognize hazards in a research environment in order to employ safe laboratory practices.
2. Summarize observations and research data in a lab notebook in order to communicate their results in a written format.
3. Explain how common biochemical and microbiological research techniques work, and evaluate when a particular technique should be applied.
4. Apply basic research techniques to answer scientific questions.
5. Interpret and evaluate experimental results to present their findings as a written report.
6. Evaluate the literature on antibiotic resistance to explain topics in this area to a scientific audience.

MICR 320 Microbes in Health and Disease Units: 3.00

This course will focus on the roles of microbes in health (human microbiome) and disease (pathogens). The molecular mechanisms of bacterial/viral virulence and the host response will be examined in order to develop an in depth understanding of the etiology of infectious diseases and the benefits derived from the human microbiome. Consult the Bachelor of Health Sciences program office
NOTE Also offered online. Learning Hours may vary.

Requirements: Minimum 3rd year (Level 3) standing and one of (MICR 221/3.0; MICR 271/3.0; MICR 229/3.0) and one of (MICR 360/3.0; MICR 386/3.0; BMED 386/3.0). Exclusion MICR 382/3.0

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Describe and apply knowledge of how microbes interact with the human host in relation to health (human microbiome) and disease (microbial pathogens). Organize & assess information from various sources to critically and appropriately problem solve.
2. Integrate the information taught in the course to provide a broad-based understanding of the global impact of microbes on health and disease. Reflect upon and track how accumulated knowledge is influencing perception of human health and infectious disease.
3. Reflect upon and document learning styles and strategies best suited to optimize depth and breadth of learning.
4. Work collaboratively in a small group setting to apply accumulated knowledge in critical evaluation of the factors that contribute to the etiology of infectious diseases.

MICR 360 Immunology Units: 3.00

The general principles and mechanism of immune reaction. Immunochemical and immunobiological aspects of antibody formation and cell-mediated immunity in health and disease will be considered.

Learning Hours: 144 (36 Lecture, 36 Online Activity, 72 Private Study)

Requirements: Prerequisite MICR 221 or MICR 271. Exclusion MICR 386.

Offering Faculty: Faculty of Health Sciences



MICR 386 Fundamentals of Immunology in Health and Disease Units: 3.00

Integrates the key principles of immunology to facilitate learning of immunology as it relates to human health and disease. This course offers real-life case studies, problems encountered and solutions applied, immunology virtual laboratory simulation, and extensive coverage of the basic science underlying each topic in the module.

Also offered online.

LEARNING HOURS may vary:120(480;72P)

Requirements: Minimum 3rd year (Level 3) standing and one of (BCHM 218/3.0; BCHM 270/3.0), and one of (MICR 270/3.0; MICR 271/3.0; MICR 221/3.0). Exclusion MICR 360/BMED 877

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Advocate for ethical issues in the immunological approach to health and life sciences by effectively researching major issues at the forefront of the discipline
2. Assess immunology resources critically (e.g. videos, virtual lab, and clinical images) and use precise written responses to present the work to both a science literate and general audience
3. Dissect a problem into its key features by thinking in an integrated manner and interpret immunological data from a virtual lab to identify consistent and inconsistent components
4. Explain the fundamentals of immunology and describe key principles of the immune system, mechanisms of immune reactions, aspects of antibody formation, and cell-mediated immunity in health and disease

MICR 435 Advanced Prokaryotic Structure and Function Units: 3.00

An in-depth analysis of the genetics, biochemistry, assembly and function of the major structures of the prokaryotic cell. Emphasis on the experimental approaches in the current literature.

Requirements: PREREQUISITES BIOL 205/3.0 and (MICR 221/3.0 or MICR271 or MICR 229/3.0 with a minimum grade of B-) and reg in the LISC Major or Spec. Plan) and (a GPA of 2.5). COREQUISITE BCHM 310/6.0 or BCHM 315/3.0 or BIOL 334/3.0.

Offering Faculty: Faculty of Health Sciences

MICR 436 Microbial Genetics Units: 3.00

A detailed description of the processes of heredity in bacteria including a discussion of gene structure and evolution, gene expression and its control, the exchange of genetic material in the microbial world and genetic engineering and its applications. The laboratory component will emphasize modern approaches to genetic engineering.

NOTE Offered in alternate years to MICR 435/3.0.

Requirements: PREREQUISITES BIOL 205/3.0 and (MICR 221/3.0 or MICR227 or MICR 229/3.0 with a minimum grade of B) and (reg in the LISC Major or Spec. Plan) and (a GPA of 2.5). COREQUISITE BCHM 310/3.0 or BCHM 315/3.0 or BIOL 334/3.0.

Offering Faculty: Faculty of Health Sciences

MICR 450 Principles of Molecular Virology Units: 3.00

Further study of contemporary virology, using the textbook as a guide to particles, genomes, replication, expression, infection and pathogenesis. Emphasizing reading and writing to develop skills in observation and critical thinking, important attributes in understanding the scientific method.

NOTE Offered in alternate years to MICR 451/3.0.

Requirements: PREREQUISITES BIOL 205/3.0 and (MICR 221/3.0 or MICR271 with a minimum grade of B-) and (Level 4 and registration in the LISC Major or Spec. Plan) and (a GPA of 2.5). COREQUISITE BCHM 310/6.0 or BCHM 315/3.0.

Offering Faculty: Faculty of Health Sciences

MICR 451 Viral Pathogenesis Units: 3.00

This molecular virology course covers viral replication strategies and virus-host interactions, with an emphasis on mechanisms of viral pathogenesis, focusing on human pathogenic viruses such as coronaviruses, hepatitis viruses, HIV, and herpesviruses. Tutorials will be in journal club format with group discussion and analysis of recent literature.

Learning Hours: 120 (24 Lecture, 12 Tutorial, 84 Private Study)

Requirements: Prerequisite Level 3 or above and registration in the LISC Major or Specialization Plan, or BHSc program and a minimum CGPA of 2.50 and (MICR 221/3.0 or MICR 271/3.0) and (BCHM 218/3.0 or BIOL 330/3.0).

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Appreciate how viruses impact health and society
2. Develop ability to interpret and evaluate primary scientific literature
3. Understand virological assays and how to interpret them
4. Learn strategies for viral entry, genome organization, protein expression and replication
5. Acquire basic understanding of virus-host interactions
6. Compare mechanisms of viral pathogenesis

MICR 452 Viral Infection and Immunity Units: 3.00

Course material will focus on the molecular basis for virus pathogenesis including host immune responses to virus infection, and viral countermeasures. Emphasis will be on viral infections that result in gastrointestinal, haematological, neurological, and respiratory diseases. Tutorials will focus on discussion of current and seminal literature.

Requirements: Prerequisite Minimum 4th year (Level 4) standing, registration in a LISC/BHSc Major or SSP, a GPA of 2.5, and one of (MICR 221; MICR 271), and one of (MICR 360; MICR 386).

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Demonstrate understanding of advanced virology topics.
2. Development of literature-based research skills in order to evaluate and critique how current research articles advance the field of virology.
3. Development of writing skills in order to critique current scientific literature and use this to support a personal opinion.
4. Participate in a collaborative group presentation to convey current topics in virology.

MICR 461 Advanced Immunology Units: 3.00

Advanced immunology course focused on current topics in immunology and immunology-related scientific research.

Requirements: Prerequisite Minimum 4th year (Level 4) standing, registration in a LISC/BHSc Major or SSP, a GPA of 2.5, and a minimum grade of A- in one of (MICR 360; MICR 386).

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Participate in a collaborative group presentation to convey current immunology topics.
2. Create an individual presentation in order to explain specific aspects of your topic.
3. Development of research skills in order to evaluate and critique how current research articles advance the field.
4. Development of writing skills in order to critique current scientific literature and use this to support a personal opinion.

MICR 483 Advanced Topics in Infectious Diseases Units: 3.00

This course will examine basic principles of infectious diseases such as Pathophysiology, Epidemiology and Transmission, and Control of Infectious Agents including an emphasis on Antimicrobial Therapy and Resistance. Selected Infectious Disease syndromes will be examined to explore unique host microbe interactions. Students will work through the topics online using interactive multimedia modules. Student assessment will include weekly online quizzes, group, and individual assignments. Active participation will also form part of student assessment. At the completion of the course, students will have an understanding of the key concepts of emerging topics in infectious diseases.

NOTE Also offered online. Consult the Bachelor of Health Sciences program office.

Requirements: Prerequisite Minimum 4th year (Level 4) standing and one of (MICR 320/3.0; MICR 270/3.0; MICR 221/3.0; MICR 271/3.0), or permission from the instructor. Equivalency BMED 483/3.0*.

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Integrate epidemiological and transmission principles of infectious diseases to independently or collaboratively explain, discuss, and appreciate the global impact of infectious diseases.
2. Use the principles learned during the study of selected infectious disease syndromes and apply those principles to advocate for effective control of infectious diseases.
3. Integrate information found in course modules and primary literature to explain the pathophysiology of selected infectious diseases and the role it plays in disease progression and treatment.

**MICR 484 Infectious Diseases and Zoonoses Units: 3.00**

This course provides the opportunity for students to apply foundational to advanced knowledge of medical microbiology and infectious disease, particularly with respect to how different vectors contribute to the overflow of pathogens into humans.

NOTE Also offered online. Consult the Bachelor of Health Sciences program office.

Learning Hours: 120 (24 Lecture, 36 Group Learning, 36 Online Activity, 24 Private Study)

Requirements: Prerequisite Level 3 or above and (MICR 221/3.0 or MICR 270/3.0 or MICR 271/3.0).

Offering Faculty: Faculty of Health Sciences

Course Learning Outcomes:

1. Gain a broad understanding of medically relevant pathogens, including bacteria, viruses, fungi, and parasites, to enable the development of an overarching concept of the key components involved.
2. Apply foundational practices of infection prevention and control to predict how those processes mitigate the spread of pathogens from animals to humans.
3. Apply knowledge and concepts of microbiology to demonstrate how pathogens impact their animal host and then predict the interplay between infection control interventions, local environments and human populations.
4. Identify, describe, and predict the outcome of a change in pathogenesis in their non-animal hosts (i.e. humans or other intermediates) and how this might impact human health.

MICR 499 Research Project in Microbiology and Immunology Units: 12.00

A research project supervised by and closely related to the research program of a faculty member. The research project involves experimental design, data collection and analysis, written report and oral presentation. Students will be required to attend seminars and tutorials on topics related to research. Limited enrolment.

NOTE Acceptance by a supervisor required prior to registration.

NOTE Students whose research requires the care and/or handling of animals must also complete the Introductory Animal Care Course and if required the appropriate Animal Use workshops through the Office of the University Veterinarian.

Learning Hours: 480 (288 Laboratory, 24 Group Learning, 24 Individual Instruction, 144 Private Study)

Requirements: Prerequisite Level 4 and registration in a LISC or ELSC Specialization Plan and cumulative GPA of 2.50 or higher and (MICR 221/3.0 or MICR 271/3.0). Exclusion Maximum 12.0 units from: ANAT 499/12.0; ANAT 599/6.0; BCHM 421/6.0; BCHM 422/6.0; BCHM 594/3.0; BCHM 595/6.0; BCHM 596/12.0; CANC 499/12.0; DISC 591/3.0; DISC 592/3.0; DISC 593/3.0; DISC 594/3.0; DISC 598/6.0; DISC 599/6.0; EPID 499/12.0; EPID 595/6.0; HSCI 591/3.0; HSCI 592/3.0; HSCI 593/3.0; HSCI 594/3.0; HSCI 595/3.0; HSCI 598/6.0; HSCI 599/6.0; LISC 499/12.0*; LISC 594/3.0; LISC 595/6.0; LISC 596/12.0; LISC 598/9.0; MICR 499/12.0; NSCI 499/12.0; PATH 499/12.0; PATH 595/6.0; PHAR 499/12.0; PHGY 499/12.0; REPD 499/12.0.

Offering Faculty: Faculty of Health Sciences