

637. Core Competencies III
Spring, Summer. 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Human Medicine; Family Practice; Obstetrics, Gynecology and Reproductive Biology; Pediatrics and Human Development; and Surgery. Administered by Human Medicine. P: FMP 602. R: Open only to graduate-professional students in College of Human Medicine.
A weekly seminar addressing core knowledge and skills from an interdisciplinary perspective.

645. Primary Health Care in Ecuador
Summer. 6 credits. R: Open only to graduate-professional students in the colleges of Human and Osteopathic Medicine and to graduate students in the College of Nursing.
Special problems and challenges to delivery of primary health care in a developing country. Culture and related health care issues in cities and rural areas.

820. Evidence-Based Medicine
Fall. 3(3-0) Interdepartmental with Epidemiology. Administered by Epidemiology. P: (EPI 810 or concurrently and STT 421 or concurrently)
Methodology of clinical epidemiology and health services outcomes research. Linkage of epidemiology with daily clinical problems.

MICROBIOLOGY MIC

**Department of Microbiology
College of Human Medicine
College of Natural Science
College of Osteopathic Medicine
College of Veterinary Medicine**

101. Preview of Microbiology
Fall. 1(1-0) R: Open only to freshmen or sophomores.
Overview of modern microbiology, emphasizing impact on society.
SA: MPH 101

103. Frontiers of Microbiology
Spring. 1(2-0) R: Open only to freshmen and sophomores.
Current microbiology research: significance to modern biological science and impact on society.

105. Microbes in Everyday Life
Fall. 3(3-0)
Role of microbes in agriculture, industry, and medicine. Impact on society of infectious diseases of plants and animals, soil fertility, water quality, biotechnology, genetic engineering, and bioremediation. Public health and environmental concerns.

111L. Cell and Molecular Biology Laboratory
Fall, Spring, Summer. 2(1-3) Interdepartmental with Biological Science; Botany and Plant Pathology; and Zoology. Administered by Biological Science. P: BS 111 or concurrently
Principles and applications of common techniques used in cell and molecular biology.

205. Allied Health Microbiology
Spring. 3(3-0) P: (BS 111 or concurrently or LBS 145 or concurrently or LBS 149H or concurrently)
Microbial structure, function, growth, death, and control related to medical and public health concerns. Host-parasite relationships, immunology, action of major pathogenic groups. Commercial applications of microbiology.
SA: MPH 205

206. Allied Health Microbiology Laboratory
Spring. 1(0-2) P: (MIC 105 or MIC 205 or concurrently)
Fundamentals of microbiological techniques including microscopy, staining, aseptic technique, culture media, identification, control with disinfectants and antibiotics, and safety in the microbiological laboratory.
SA: MPH 206

301. Introductory Microbiology
Fall, Spring. 3(3-0) P: (BS 111 or LBS 145 or LBS 149H) and (CEM 251 or concurrently)
Fundamentals of microbiology, including microbial structure and function, nutrition and growth, death and control. Importance and applications of major microbial groups.
SA: MPH 301

302. Introductory Microbiology Laboratory
Spring. 1(0-3) P: (MIC 105 or concurrently or MIC 205 or concurrently or MIC 301 or concurrently)
Methodology of microbiology: microscopy, staining, aseptic technique, culture media, quantification, and laboratory safety.
SA: MPH 302

408. Advanced Microbiology Laboratory (W)
Fall. 3(1-6) P: (MIC 302 and MIC 431 or concurrently) and completion of Tier I writing requirement. R: Open only to students in the Department of Microbiology or LBS Environmental Biology/Microbiology or Microbiology coordinate major.
Microbiological techniques and procedures to study physiology and genetics of bacteria and bacteriophages. Collection and critical assessment of quantitative data and written communication of results.
SA: MPH 408

409. Eukaryotic Cell Biology
Spring. 3(3-0) P: (BS 111 or LBS 145 or LBS 149H) and (BCH 401 or concurrently or BCH 462 or concurrently)
Structure and function of nucleated cells. Emphasis on the molecular mechanisms that underlie cell processes.
SA: MIC 403, MPH 403

413. Virology
Spring. 3(3-0) Interdepartmental with Botany and Plant Pathology. P: (BCH 462 or concurrently) RB: (MIC 409)
Viruses and modern molecular biology. Viral replication and gene expression of the major classes of viruses. Virus-cell interactions and viral diseases.
SA: MPH 403

421. Prokaryotic Cell Physiology
Fall. 3(3-0) P: (MIC 301 and BCH 461 or concurrently)
Prokaryotic cell structure and function. Growth and replication. Macromolecular synthesis and control.
SA: MIC 401, MPH 401

425. Microbial Ecology
Spring. 3(3-0) Interdepartmental with Crop and Soil Sciences. P: (MIC 301)
Microbial population and community interactions. Microbial activities in natural systems, including associations with plants or animals.
SA: MPH 425

426. Biogeochemistry
Summer. 3 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Crop and Soil Sciences; Geological Sciences; and Zoology. P: (BS 110 or LBS 144 or LBS 148H or BS 111 or LBS 145 or LBS 149H) and (CEM 143 or CEM 251)
Integration of the principles of ecology, microbiology, geochemistry, and environmental chemistry. Societal applications of research in aquatic and terrestrial habitats.
SA: MPH 426

431. Microbial Genetics
Fall. 3(3-0) P: (MIC 301 or concurrently)
Genetics of bacteria, their viruses, plasmids, and transposons. Emphasis on genetic principles.
SA: MIC 401, MPH 401

440. Food Microbiology
Spring. 3(3-0) Interdepartmental with Food Science. Administered by Food Science. P: (MIC 205 or MIC 301) and completion of Tier I writing requirement. R: Not open to freshmen or sophomores.
Major groups of microorganisms of importance to the food industry. Emphasis on ecological, physiological, and public health aspects.
SA: MPH 440

440. Food Microbiology
Spring. 3(3-0) Interdepartmental with Food Science. Administered by Food Science. P: (MIC 205 or MIC 301) and completion of Tier I writing requirement. R: Not open to freshmen or sophomores.
Major groups of microorganisms of importance to the food industry. Emphasis on ecological, physiological, and public health aspects.
SA: MPH 440

441. Food Microbiology Laboratory
Spring. 1(0-3) Interdepartmental with Food Science and Human Nutrition. Administered by Food Science and Human Nutrition. P: (FSC 440 or concurrently) and completion of Tier I writing requirement. (MIC 206 or MIC 302)
Methods for studying major groups of microorganisms important to the food industry. Isolation, enumeration, characterization, identification, and use of microorganisms.
SA: MIC 441, MPH 441

Descriptions—Microbiology of Courses

- 441. Food Microbiology Laboratory**
Spring. 2(0-4) Interdepartmental with Food Science and Human Nutrition. Administered by Food Science and Human Nutrition. P: (FSC 440 or concurrently) (MIC 206 or MIC 302)
Methods for studying major groups of microorganisms important to the food industry. Isolation, enumeration, characterization, identification, and use of microorganisms.
SA: MPH 441
- 445. Basic Biotechnology**
Fall. 3(3-0) P: (MIC 205 or MIC 301)
Growth and genetic improvement of industrial microorganisms. Fermentation fundamentals. Specific classical and recombinant-based bioprocesses and bioconversions of commercial importance.
SA: MPH 445
- 451. Immunology**
Fall. 3(3-0) P: (BS 111 or LBS 145 or LBS 149H) and (BCH 401 or concurrently or BCH 461 or concurrently) RB: (MIC 409)
Structure and function of molecules involved in immune responses. Quantification of immune responses and cellular participants. Immunologic abnormalities. Immunotherapy. Experimental approaches to dissection of immune functions.
SA: MPH 451
- 461. Molecular Pathogenesis**
Spring. 3(3-0) P: (MIC 301) RB: (MIC 431)
Molecular basis of microbial virulence. Nature of determinants and their role in overcoming host defense mechanisms.
SA: MPH 461
- 463. Medical Microbiology**
Fall. 3(3-0) P: (MIC 205 or MIC 301) RB: (MT 432 Or MIC 451) R: Open only to juniors or seniors in the Department of Microbiology or Clinical Laboratory Sciences or Medical Technology major or LBS Environmental Biology/Microbiology or Medical Technology or Microbiology coordinate major.
Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity.
SA: MPH 463
- 464. Diagnostic Microbiology Laboratory**
Fall. 1(0-3) P: (MIC 302 and MIC 463 or concurrently) R: Open only to juniors or seniors in the Department of Microbiology or Clinical Laboratory Sciences or Medical Technology major or LBS Environmental Biology/Microbiology or Medical Technology or Microbiology coordinate major.
Diagnostic procedures for the identification of pathogenic bacteria.
SA: MPH 464
- 490. Special Problems in Microbiology**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Approval of department.
Library research or tutorial instruction in advanced laboratory techniques.
SA: MPH 490

- 491. Current Topics in Microbiology**
Spring. 3(3-0) R: Open only to seniors in the Department of Microbiology or LBS Environmental Biology/Microbiology or Microbiology coordinate major.
Capstone experience for Microbiology majors. Presentation and discussion of journal articles. Writing of position papers. Topics such as microbial physiology, ecology, genetics, molecular biology, virology, immunology, or pathogenesis.
SA: MPH 491
- 492. Undergraduate Research Seminar**
Spring. 1(1-0) P: (MIC 499 or MIC 499H) R: Open only to seniors in the Department of Microbiology or LBS Environmental Biology/Microbiology or Microbiology coordinate major.
Presentation and group discussion of undergraduate research results.
SA: MPH 492
- 499. Undergraduate Research**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to students in the Department of Microbiology or LBS Environmental Biology/Microbiology or Microbiology coordinate major.
Participation in a laboratory research project. Together with MPH 492 constitutes a capstone experience.
SA: MPH 499
- 499H. Honors Research**
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to Honors College students in the Microbiology major or LBS Microbiology coordinate major.
Research project with thesis and oral report. A portion of Microbiology capstone experience.
SA: MPH 499H
- 522. Medical Microbiology and Immunology**
Spring. 5(4-2) R: Graduate-professional students in colleges of Human and Osteopathic Medicine.
Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology and their relation to disease in humans.
SA: MPH 522
- 561. Veterinary Immunology**
Fall. 2(2-0) R: Open only to graduate-professional students in College of Veterinary Medicine.
Concepts of immunochemistry, immunobiology, and immunopathology related to the healthy state and the host response to infection and parasitism.
SA: MPH 561
- 567. Veterinary Microbiology and Infectious Diseases I**
Spring. 5(4-3) R: Open only to graduate-professional students in College of Veterinary Medicine. Not open to students with credit in VM 564.
Structure, function, and diagnostic characteristics of bacteria and fungi related to pathogenicity, transmission, control, host response, therapy, and management of selected diseases of animals.
SA: MIC 563, MIC 565

- 569. Veterinary Microbiology and Infectious Diseases II**
Fall. 5(4-3) R: Open only to graduate-professional students in College of Veterinary Medicine.
Structure, function, and diagnostic characteristics of viruses, protozoa, and helminths related to pathogenicity, transmission, control, host response, therapy, and management of selected diseases of animals.
SA: MIC 563, MIC 565, MPH 531C, MPH 531D
- 660. Veterinary Clinical Microbiology Clerkship**
Fall, Spring, Summer. 3 credits. P: Completion of semester 5 of the professional veterinary program. R: Open only to graduate-professional students in the College of Veterinary Medicine.
Clinical bacteriology with an optional experience in parasitology, virology, or both.
- 690. Veterinary Microbiology Clerkship**
Fall, Spring, Summer. 1 to 6 credits. A student may earn a maximum of 6 credits in all enrollments for this course. R: Completion of 5 semesters of the graduate-professional program in the College of Veterinary Medicine.
Laboratory-based investigation of microbiological problems pertinent to veterinary medicine.
SA: MPH 690
- 813. Molecular Virology**
Spring of even years. 3(3-0) R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources.
Molecular nature and biochemistry of replication of animal viruses. Current advances, research concepts, and the role of viruses in molecular biology research.
SA: MPH 813
- 821. Microbial Physiology**
Spring of odd years. 3(3-0) P: MIC 401. R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources.
Molecular architecture, assembly of cell parts, metabolism, and general physiology of typical eubacteria.
SA: MPH 821
- 825. Cell Structure and Function**
Spring. 3(3-0) Interdepartmental with Biochemistry; and Physiology. Administered by Biochemistry. P: BCH 401 or BCH 461.
Molecular basis of structure and function. Cell properties: reproduction, dynamic organization, integration, programmed and integrative information transfer. Original investigations in all five kingdoms.
SA: MPH 825
- 827. Diversity of Prokaryotes**
Fall of odd years. 3(3-0) P: BCH 461; MIC 421 or concurrently. R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources.
Morphological and physiological properties of groups of bacteria and archaea. Relationship of those properties to ecological niche and importance.
SA: MPH 827

829. Advanced Microbial Ecology
Fall of even years. 3(3-0) Interdepartmental with Crop and Soil Sciences.

Functional roles of microorganisms, their population dynamics and interactions, and their mechanisms of evolutionary change in natural communities, laboratory experiments, and mathematical models.

833. Microbial Genetics
Fall. 3(3-0) R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources.
Gene structure and function. Genetic regulation at classical and molecular levels in prokaryotes and lower eukaryotes.
SA: MPH 833

835. Eukaryotic Molecular Genetics
Spring. 3(3-0) Interdepartmental with Genetics. P: BCH 462, ZOL 341. R: Open only to graduate students in the colleges of Agriculture and Natural Resources, Engineering, Human Medicine, Natural Science, Osteopathic Medicine, and Veterinary Medicine.
Gene structure and function in animals, plants, and fungi. Basic aspects of modern human genetics and the genetic basis for disease. Molecular genetic analyses. Eukaryotic modeling systems.

841. Soil Microbiology
Spring of even years. 3(3-0) Interdepartmental with Crop and Soil Sciences. P: MIC 425.
Ecology, physiology, and biochemistry of microorganisms indigenous to soil.
SA: MPH 841

851. Immunology
Fall of odd years. 3(3-0) R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources.
Functional aspects of immune responses; synthesis, structure, and function of effector molecules; cell-cell interactions; current advances and research techniques.
SA: MPH 851

855. Molecular Evolution: Principles and Techniques
Fall of odd years. 3(3-0) Interdepartmental with Zoology; and Botany and Plant Pathology. Administered by Zoology. RB: (ZOL 341 Or ZOL 445)
Current techniques used to characterize and compare genes and genomes. Types of genetic variation, assays of variation. Emphasis on data analysis, and computer use to conduct a phylogenetic analysis to compare organisms and infer relationships.

890. Special Problems in Microbiology
Fall, Spring, Summer. 1 to 4 credits. A student may earn a maximum of 8 credits in all enrollments for this course. R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources. Approval of department.
Individualized laboratory or library research.
SA: MPH 890

892. Seminar
Fall, Spring. 1(1-0) A student may earn a maximum of 6 credits in all enrollments for this course. R: Open only to graduate students in College of Agriculture and Natural Resources, College of Engineering, College of Human Medicine, College of Natural Science, College of Osteopathic Medicine, or College of Veterinary Medicine.
Student review and presentation of selected topics in microbiology and public health.
SA: MPH 892

899. Master's Thesis Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 24 credits in all enrollments for this course. R: Open only to graduate students in Microbiology and Public Health.
SA: MPH 899

991. Topics in Microbiology
Fall, Spring. 1 to 3 credits. A student may earn a maximum of 6 credits in all enrollments for this course.
Topics are selected from traditional subdisciplines such as bacteriology, virology, cell biology, and immunology or from transecting subdisciplines such as microbial genetics, physiology, molecular biology and ecology.
SA: MPH 991

999. Doctoral Dissertation Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 99 credits in all enrollments for this course. R: Open only to graduate students in Microbiology and Public Health.
SA: MPH 999

MILITARY SCIENCE MS

Department of Military Science Office of the Provost

101A. Leadership: The Military Profession
Fall. 1(1-1) Not open to students with credit in MS 101B.
Introduction to military leadership and fundamental concepts of leadership. Application of leadership doctrine. The role of the U.S. Army, Army Reserves, and National Guard. Leadership laboratory introduces basic military skills.
SA: MS 101

101B. Leadership: The Military Profession
Spring. 1(1-2) Not open to students with credit in MS 101A.
Introduction to military leadership and fundamental concepts of leadership. Application of leadership doctrine. The role of the U.S. Army, Army Reserves, and National Guard. Leadership laboratory introduces basic military skills.
SA: MS 101

102A. Leadership: Wilderness Survival
Fall. 1(1-1) Not open to students with credit in MS 102B.
Introduction to wilderness survival including the psychology of survival, survival planning, and survival kits; shelters; water procurement; fire craft; field expedient weapons, tools, and equipment; desert, tropical, and cold weather survival; basic survival medicine; and food procurement.

102B. Leadership: Wilderness Survival
Spring. 1(1-2) Not open to students with credit in MS 102A.
Introduction to wilderness survival including the psychology of survival, survival planning, and survival kits; shelters; water procurement; fire craft ; field expedient weapons, tools, and equipment; desert, tropical, and cold weather survival; basic survival medicine; and food procurement.
SA: MS 102

201A. Leadership: The Military Leader
Fall. 1(1-1) Not open to students with credit in MS 201B.
Introduction to effective leadership. Communications. Value of the United States Army. Responsibilities of military officers and professionalism. Laboratory includes tactics, marksmanship training, and military skills.
SA: MS 201

201B. Leadership: The Military Leader
Spring. 1(1-2) Not open to students with credit in MS 201A.
Introduction to effective leadership. Communications. Value of the United States Army. Responsibilities of military officers and professionalism. Laboratory includes tactics, marksmanship training, and military skills.
SA: MS 201

202A. Introduction to Land Navigation and Tactics
Fall. 1(1-1) Not open to students with credit in MS 202B.
Introduction to land navigation using military maps and lensatic compass. Planning routes using azimuth and distance. Determining location by terrain association and other methods. Introduction to infantry defensive and reconnaissance operations.
SA: MS 202

202B. Introduction to Land Navigation and Tactics
Spring. 1(1-2) Not open to students with credit in MS 202A.
Introduction to land navigation using military maps and lensatic compass. Planning routes using azimuth and distance. Determining location by terrain association and other methods. Introduction to infantry defensive and reconnaissance operations.
SA: MS 202

301. Leading Small Organizations
Fall. 3(3-2) P: (MS 101A or MS 101B) and (MS 102A or concurrently or MS 102B or concurrently) and (MS 201A or concurrently or MS 201B or concurrently) and (MS 202A or concurrently or MS 202B or concurrently) Completion of basic camp or boot camp. Must meet U.S. Army contracting requirements.
Skills required for military officers: communication, team building, delegating tasks, supervision, ethics, and physical fitness. Leading small units. Participation in physical fitness is required.