

Medicine—MED

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; Surgery. Administered by Human Medicine. RB: (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. Given at the University of Guayaquil, Ecuador. 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
Spring of even years. 3(3-0)
Interdepartmental with Epidemiology. Administered by Department of Epidemiology. P:M: (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 AND MOLECULAR GENETICS

MMG

Department of Microbiology
and Molecular Genetics
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. SA: MPH 101

Overview of modern microbiology, emphasizing impact on society.

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; Plant Biology; Zoology. Administered by Natural Science. P:M: (BS111 or concurrently) Not open to students with credit in LBS 159H.

Principles and applications of common techniques used in cell and molecular biology.

205 Allied Health Microbiology
Spring. 3(3-0) SA: MPH 205
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.

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

301 Introductory Microbiology
Fall, Spring. 3(3-0) P:M: (BS 111 or LBS 145 or LBS 149H) and (CEM 251 or concurrently or CEM 351 or concurrently or CEM 143) SA: MPH 301

Fundamentals of microbiology, including microbial structure and function, nutrition and growth, death and control. Importance and applications of major microbial groups.

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

408 Advanced Microbiology Laboratory (W)
Fall. 3(1-6) P:M: (MMG 302 and MMG 431 or concurrently) and completion of Tier I writing requirement. R: Open only to students in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 408

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.

409 Eukaryotic Cell Biology
Spring. 3(3-0) P:M: (BS 111 or LBS 145 or LBS 149H) and (BMB 401 or concurrently or BMB 462 or concurrently) SA: MIC 403, MPH 403

Structure and function of nucleated cells. Emphasis on the molecular mechanisms that underlie cell processes.

413 Virology
Spring. 3(3-0) P:M: (BMB 462 or concurrently) RB: (MMG 409) SA: MPH 403
Viruses and modern molecular biology. Viral replication and gene expression of the major classes of viruses. Virus-cell interactions and viral diseases.

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

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

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

431 Microbial Genetics
Fall. 3(3-0) P:M: (BMB 461 or concurrently) RB: (MMG 301 or ZOL 341) SA: MIC 401, MPH 401
Genetics of bacteria, their viruses, plasmids, and transposons. Emphasis on genetic principles.

433 Microbial Genomics
Spring. 3(2-3) P:M: (MMG 431) RB: (MMG 421 or BMB 461) and (CSE 101)
Structure of microbial genomes and implications for growth and evolution of bacteria and fungi. Computer analysis of genome sequence databases. Applications to gene expression and phylogenetic analysis.

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

441 Food Microbiology Laboratory
Spring. 2(0-4) Interdepartmental with Food Science. Administered by Department of Food Science and Human Nutrition. P:M: (FSC 440 or concurrently) and completion of Tier I writing requirement. RB: (MMG 206 or MMG 302) SA: MPH 441
Methods for studying major groups of microorganisms important to the food industry. Isolation, enumeration, characterization, identification, and use of microorganisms.

445 Basic Biotechnology
Fall. 3(3-0) P:M: (MMG 205 or MMG 301) SA: MPH 445
Growth and genetic improvement of industrial microorganisms. Fermentation fundamentals. Specific classical and recombinant-based bioprocesses and bioconversions of commercial importance.

- 451 Immunology**
Fall. 3(3-0) P:M: (BS 111 or LBS 145 or LBS 149H) and (BMB 401 or concurrently or BMB 461 or concurrently) RB: (MMG 409) SA: MPH 451
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.
- 461 Molecular Pathogenesis**
Spring. 3(3-0) P:M: (MMG 301) RB: (MMG 431) SA: MPH 461
Molecular basis of microbial virulence. Nature of determinants and their role in overcoming host defense mechanisms.
- 463 Medical Microbiology**
Fall. 3(3-0) P:M: (MMG 205 or MMG 301) RB: (MT 432 or MMG 451) R: Open only to juniors or seniors in the Department of Microbiology and Molecular Genetics or Clinical Laboratory Sciences or Medical Technology major or LBS Environmental Biology/Microbiology or Medical Technology or Microbiology coordinate major. SA: MPH 463
Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity.
- 464 Diagnostic Microbiology Laboratory**
Fall. 2(0-4) P:M: (MMG 463 or concurrently) R: Open only to juniors or seniors in the Department of Microbiology and Molecular Genetics or Clinical Laboratory Sciences or Medical Technology major or LBS Environmental Biology/Microbiology or Medical Technology or Clinical Laboratory Science or Microbiology coordinate major. SA: MPH 464, MIC 464
Diagnostic procedures for the identification of pathogenic microbes.
- 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. SA: MPH 490
Library research or tutorial instruction in advanced laboratory techniques.
- 491 Current Topics in Microbiology**
Spring. 3(4-0) R: Open only to seniors in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 491
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.
- 492 Undergraduate Research Seminar**
Spring. 1(1-0) P:M: (MMG 499 or MMG 499H) R: Open only to seniors in the Department of Microbiology and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 492
Presentation and group discussion of undergraduate research results.
- 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 and Molecular Genetics or LBS Environmental Biology/Microbiology or Microbiology coordinate major. SA: MPH 499
Participation in a laboratory research project.
- 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 or Environmental Biology/Microbiology major or LBS Microbiology coordinate major or LBS Environmental Biology/Microbiology coordinate major. SA: MPH 499H
Research project with thesis and oral report. A portion of Microbiology capstone experience.
- 522 Medical Microbiology and Immunology**
Spring. 5(4-2) R: Graduate-professional students in colleges of Human and Osteopathic Medicine. SA: MPH 522
Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology and their relation to disease in humans.
- 561 Veterinary Immunology**
Fall. 3(3-0) R: Open only to graduate-professional students in the College of Veterinary Medicine. SA: MPH 561, MIC 561
Concepts of cell biology, immunochemistry, immunobiology, and immunopathology related to the healthy state and the host response to infection and parasitism.
- 567 Veterinary Microbiology and Infectious Diseases I**
Spring. 5(4-3) R: Open only to graduate-professional students in College of Veterinary Medicine. SA: MIC 563, MIC 565, MPH 563, MPH 565 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.
- 569 Veterinary Microbiology and Infectious Diseases II**
Fall. 5(4-3) R: Open only to graduate-professional students in College of Veterinary Medicine. SA: MIC 563, MIC 565, MPH 531C, MPH 531D, MPH 563, MPH 565
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.
- 660 Veterinary Clinical Bacteriology Clerkship**
Fall, Spring, Summer. 3 credits. R: Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine.
Guided clinical bacteriology experience
- 662 Clinical Veterinary Virology Clerkship**
Fall, Spring, Summer. 3 credits. R: Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine.
Guided clinical virology experience
- 664 Veterinary Clinical Parasitology Clerkship**
Fall, Spring, Summer. 3 credits. R: Completion of semester 5 of the graduate-professional program in the College of Veterinary Medicine.
Guided clinical parasitology experience
- 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. SA: MPH 690
Laboratory-based investigation of microbiological problems pertinent to veterinary medicine.
- 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. SA: MPH 813
Molecular nature and biochemistry of replication of animal viruses. Current advances, research concepts, and the role of viruses in molecular biology research.
- 821 Microbial Physiology**
Spring of odd years. 3(3-0) RB: (MMG 401) R: Open only to graduate students in the Colleges of Human Medicine, Osteopathic Medicine, Veterinary Medicine, Natural Science, and Agriculture and Natural Resources. SA: MPH 821
Molecular architecture, assembly of cell parts, metabolism, and general physiology of typical eubacteria.
- 825 Cell Structure and Function**
Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology; Physiology. Administered by Department of Biochemistry and Molecular Biology. RB: BMB 401 or BMB 461. SA: BCH 825
Molecular basis of structure and function. Cell properties: reproduction, dynamic organization, integration, programmed and integrative information transfer. Original investigations in all five kingdoms.
- 827 Diversity of Prokaryotes**
Fall of odd years. 3(3-0) RB: (BMB 461 and MMG 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. SA: MPH 827
Morphological and physiological properties of groups of bacteria and archaea. Relationship of those properties to ecological niche and importance.
- 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.

Microbiology and Molecular Genetics—MMG

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. SA: MPH 833

Gene structure and function. Genetic regulation at classical and molecular levels in prokaryotes and lower eukaryotes.

835 Eukaryotic Molecular Genetics
Spring. 3(3-0) Interdepartmental with Genetics. RB: (BMB 462 and 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. RB: (MMG 425) SA: MPH 841

Ecology, physiology, and biochemistry of microorganisms indigenous to soil.

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. SA: MPH 851

Functional aspects of immune responses; synthesis, structure, and function of effector molecules; cell-cell interactions; current advances and research techniques.

855 Molecular Evolution: Principles and Techniques
Fall of odd years. 3(3-0) Interdepartmental with Zoology; Plant Biology. Administered by Department of Zoology. RB: (ZOL 341 or ZOL 445)

Current techniques used to characterize and compare genes and genomes. Genetic variation, assays of variation. Data analysis and computer use to conduct a phylogenetic analysis to compare organisms and infer relationships.

861 Advanced Microbial Pathogenesis
Fall of even years. 3(3-0) RB: (MMG 461 or MMG 409)

Molecular basis of microbial virulence. Virulence factors of microorganisms and the relationship of these factors to disease; host-pathogen interactions.

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. SA: MPH 890

Individualized laboratory or library research.

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. SA: MPH 892

Student review and presentation of selected topics in microbiology and public health.

899 Master's Thesis Research
Fall, Spring, Summer. 1 to 12 credits. A student may earn a maximum of 36 credits in all enrollments for this course. R: Open only to graduate students in Microbiology and Public Health. SA: MPH 899

Master's thesis research.

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. SA: MPH 991

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.

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 Molecular Genetics. SA: MPH 999

Doctoral dissertation research.

MILITARY SCIENCE

MS

Department of Military Science Office of the Provost

101A Leadership: The Military Profession
Fall. 1(1-1) SA: MS 101 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.

101B Leadership: The Military Profession
Spring. 1(1-2) SA: MS 101 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.

102A Leadership: Wilderness Survival
Fall. 1(1-1) SA: MS 102 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) SA: MS 102 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.

201A Leadership: The Military Leader
Fall. 1(1-1) SA: MS 201 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.

201B Leadership: The Military Leader
Spring. 1(1-2) SA: MS 201 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.

202A Introduction to Land Navigation and Tactics
Fall. 1(1-1) SA: MS 202 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.

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.

301 Leading Small Organizations
Fall. 3(3-2) RB: (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.

302 Leadership: Small Unit Tactics
Spring. 3(3-2) RB: (MS 301)

Basic military tactics and the military communication/orders process focusing on small units. Application of lessons learned from leadership case studies to practical exercises of leadership. Delegation of tasks and supervision of subordinates in a stressful environment.