

**Descriptions —Medicine
of
Courses**

611. Cardiology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Evaluation of patients with cardiac diseases. Special diagnostic procedures including cardiac cuticularization, phonocardiography, echocardiography, and electrocardiography.

612. Nephrology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Integrated concepts of renal physiology and pathophysiology of renal disease. Clinical experience.

613. Dermatology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Experience in a dermatologist's office to develop clinical, observational, and diagnostic skills in dermatology.

614. Pulmonary Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Pulmonary physiology. Evaluation of pulmonary function. Diagnosis and treatment of common pulmonary diseases.

615. Gastroenterology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Experience with gastrointestinal problems in ambulatory and hospital settings. Emphasis on continuity and comprehensive care.

616. Allergy Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Ambulatory and hospital based experience to develop diagnostic skills in allergy. Review of basic therapeutics related to allergic diseases.

617. Neurology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Office and inpatient experience. Evaluation and management of neurological disease.

618. Infectious Diseases Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Clinical problems in infectious and immunologic diseases. Integrated basic science input is provided in seminars.

619. Ambulatory Care Clerkship
Fall, Spring, Summer. 1 to 3 credits. A student may earn a maximum of 15 credits in all enrollments for this course. Interdepartmental with Family Practice and Pediatrics. Administered by Family Practice.
P: FMP 602. R: Open only to graduate-professional students in College of Human Medicine.
Continuous and comprehensive patient care under supervision of appropriate physicians.

622. Endocrinology and Metabolism Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Clinical and/or clinical-research clerkship: endocrine diseases, electrolyte abnormalities, endocrine hypertension, or diabetes mellitus.

623. Advanced Medicine
Fall, Spring, Summer. 6 credits. A student may earn a maximum of 18 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Hospital-based clinical experience in diagnosing and managing acutely ill patients with non-surgical problems.

626. Physical Medicine and Rehabilitation Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Developing regimens for physical medicine procedures, occupational therapy and rehabilitation skills.

627. Rheumatology Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Combined ambulatory and hospital consultative clerkship for diagnostic skills in areas of rheumatic diseases.

628. Advanced Internal Medicine
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Clinical experiences to refine diagnostic and management skills in general internal medicine.

630. Emergency Medicine Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Clinical diagnosis and treatment of emergencies seen in community emergency departments.

632. Occupational Medicine Clerkship
Fall, Spring, Summer. 2 to 12 credits. A student may earn a maximum of 12 credits in all enrollments for this course.
P: MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Health problems of chemical and mineral dust, radiation, and repetitive trauma.

635. Core Competencies I
Fall. 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Human Medicine, Family Practice, and Pediatrics and Human Development. 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.

636. Core Competencies II
Spring. 2 credits. A student may earn a maximum of 6 credits in all enrollments for this course. Interdepartmental with Human Medicine and Family Practice. 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.

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, Pediatrics and Human Development, Family Practice, Surgery, and Obstetrics, Gynecology and Reproductive Biology. 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.

640. Advanced Comprehensive Care
Fall, Spring, Summer. 6 credits. A student may earn a maximum of 18 credits in all enrollments for this course. Interdepartmental with Human Medicine, Pediatrics and Human Development, Family Practice, and Obstetrics, Gynecology and Reproductive Biology. Administered by Human Medicine.
P: FMP 608, PHD 600, MED 608. R: Open only to graduate-professional students in College of Human Medicine.
Clinical experience in community-oriented primary care. Emphasis on urban and rural underserved populations.

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.

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 and sophomores. Not open to students with credit in a microbiology course.
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 credits. 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: CEM 141 or CEM 151.
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 credit.
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.
- 301. Introductory Microbiology**
Spring. 3(3-0)
P: BS 111; 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.
- 302. Introductory Microbiology Laboratory**
Spring. 1 credit.
P: MIC 301 or concurrently.
Methodology of microbiology: microscopy, staining, aseptic technique, culture media, quantification, and laboratory safety.
- 408. Advanced Microbiology Laboratory (W)**
Fall. 3(1-6)
P: MIC302 R: Open only to Microbiology and LBS Microbiology majors. Completion of Tier I writing requirement.
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: BS 111.
Structure and function of nucleated cells. Emphasis on the molecular mechanisms that underlie cell processes.
SA: MIC 403
- 413. Virology**
Spring. 3(3-0) Interdepartmental with Botany and Plant Pathology.
P: MIC 409 or BCH 462.
Viruses and modern molecular biology. Viral replication and gene expression of the major classes of viruses. Virus-cell interactions and viral diseases.
SA: MIC 403
- 421. Prokaryotic Cell Physiology**
Fall. 3(3-0)
P: MIC 301; BCH 461 or concurrently.
Prokaryotic cell structure and function. Growth and replication. Macromolecular synthesis and control
SA: MIC 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.
- 426. Biogeochemistry**
Summer. 3 credits. Given only at W.K. Kellogg Biological Station. Interdepartmental with Geological Sciences, Crop and Soil Sciences, and Zoology.
P: BS 110 or BS 111, 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.
- 431. Microbial Genetics**
Fall. 3(3-0)
P: BS 111.
Genetics of bacteria, their viruses, plasmids, and transposons. Emphasis on genetic principles.
SA: MIC 401
- 440. Food Microbiology**
Spring. 3(3-0) Interdepartmental with Food Science. Administered by Food Science.
P: MIC 205. R: Not open to freshmen and sophomores.
Major groups of microorganisms of importance to the food industry. Emphasis on ecological, physiological, and public health aspects.
- 441. Food Microbiology Laboratory**
Spring. 1 credit. Interdepartmental with Food Science. Administered by Food Science.
P: FSC 440 or concurrently; MIC 206. R: Not open to freshmen and sophomores. Open only to majors in Food Engineering, Food Science, Foods: Technology and Management, or Microbiology and Public Health. Completion of Tier I writing requirement.
Methods for studying major groups of microorganisms important to food industry. Isolation, enumeration, characterization, identification and use of microorganisms.
- 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.
- 451. Immunology**
Fall. 3(3-0)
P: MIC 409.
Structure and function of molecules involved in immune responses. Quantitation of immune responses and cellular participants. Immunologic abnormalities. Immunotherapy. Experimental approaches to dissection of immune functions.
- 461. Molecular Pathogenesis**
Spring. 3(3-0)
P: MIC 431.
Molecular basis of microbial virulence. Nature of determinants and their role in overcoming host defense mechanisms.
- 463. Medical Microbiology**
Fall. 3(3-0)
P: MIC 301. R: Open only to Microbiology, Medical Technology, Clinical Laboratory Sciences, and LBS Microbiology and Medical Technology majors.
Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity.
- 464. Diagnostic Microbiology Laboratory**
Fall. 1 credit.
P: MIC 302, MIC 463 or concurrently. R: Open only to Microbiology, Medical Technology, Clinical Laboratory Sciences, and LBS Microbiology, Medical Technology, and Clinical Laboratory Sciences majors.
Diagnostic procedures for the identification of pathogenic bacteria.
- 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.
- 491. Current Topics in Microbiology**
Spring. 3(3-0)
R: Open only to seniors in Microbiology and LBS Microbiology majors.
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: MIC 499 or MIC 499H. R: Open only to Microbiology and LBS Microbiology majors.
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 Microbiology and LBS Microbiology majors.
Participation in a laboratory research project. Together with MPH 492 constitutes a capstone experience.
- 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 Microbiology and LBS Microbiology majors.
Research project with thesis and oral report. A portion of Microbiology capstone experience.
- 512. Infectious Diseases**
Spring. 4 credits. Interdepartmental with Medicine. Administered by Medicine.
P: MIC 511 or approval of department. R: Open only to graduate-professional students in College of Human Medicine.
Infectious diseases of humans. Biology of the causative microorganism, epidemiology, pathogenesis, host-parasite relationships. Clinical and laboratory diagnosis, and clinical management.
- 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.
- 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.

**Descriptions—Microbiology
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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: MPH 531C, MPH 531D, MIC 563, MIC 565

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.

813. Molecular Virology

Spring of even-numbered 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.

821. Microbial Physiology

Spring of odd-numbered 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.

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.

827. Diversity of Prokaryotes

Fall of odd-numbered 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.

828. Bacterial Diversity Laboratory

Fall of odd-numbered years. 2 credits.

P: MIC 827 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.

Isolation and identification of representative groups of bacteria.

829. Advanced Microbial Ecology

Fall of even-numbered 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.

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-numbered years. 3(3-0) Interdepartmental with Crop and Soil Sciences.

P: MIC 425.

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

851. Immunology

Fall of odd-numbered 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.

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.

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.

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.

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.

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.

MILITARY SCIENCE MS

**Department of Military Science
Office of the Provost**

101A. Leadership: The Military Profession

Fall. 1(1-1)

R: Not open to students with credit in MS 101B.

Technical, ethical, and personal ramifications of officership. Introduction to military leadership. Lab introduces military skills.

SA: MS 101

101B. Leadership: The Military Profession

Spring. 1(1-2)

R: Not open to students with credit in MS 101A.

Analysis of military profession from several academic perspectives. Technical, ethical, and personal ramifications of officership. Introduction to military leadership. Leadership laboratory introduces military skills.

SA: MS 101

102A. Leadership: Wilderness Survival

Fall. 1(1-1)

R: Not open to students with credit in MS 102B.

Introduction to wilderness survival including the psychology of survival, survival planning, survival kits; knots; shelters; water procurement; fire craft; field expedient; weapons, tools and equipment; desert, tropical, and cold weather survival; basic survival medicine.

102B. Leadership: Wilderness Survival

Spring. 1(1-2)

R: Not open to students with credit in MS 102A.

Introduction to wilderness survival including the psychology of survival, survival planning, survival kits; knots; shelters; water procurement; fire craft; field expedient; weapons, tools and equipment; desert, tropical, and cold weather survival; basic survival medicine.

201A. Leadership: The Military Leader

Fall. 1(1-1)

R: Not open to students with credit in MS 201B.

Individual leadership development using standardized assessment technology. Administration, personal relations, and decision making. Military writing and professional obligations. Lab includes rappelling and marksmanship.

SA: MS 201

201B. Leadership: The Military Leader

Spring. 1(1-2)

R: Not open to students with credit in MS 201A.

Individual leadership development using standardized assessment technology. Administration, personal relations, and decision making. Military writing and professional obligations. Lab includes rappelling and marksmanship.

SA: MS 201