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.

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.

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.

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(0-2)
P: MIC 105, 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(0-3)
P: MIC 301 or concurrently.
Methodology of microbiology: microscopy, staining, aseptic technique, culture media, quantification, and laboratory safety.

406. Medical Mycology
Spring. 3(2-3) Interdepartmental with Botany and Plant Pathology, and Medical Technology. Administered by Botany and Plant Pathology.
P: BOT 402, MIC 302.
Characteristics and laboratory identification of fungal diseases in humans and other animals. Laboratory techniques. Morphology of causative fungi.

408. Advanced Microbiology Laboratory (W)
Fall. 3(1-6)
P: MIC 302; MIC 401 or concurrently. R: Open only to 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.

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.

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

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.

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(0-3) 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.
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 or Medical Technology or Clinical Laboratory Sciences majors.
Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity.

464. Diagnostic Microbiology Laboratory
Fall. 1(0-3)
P: MIC 302, MIC 463 or concurrently. R: Open only to Microbiology or Medical Technology or Clinical Laboratory Sciences majors.
Diagnostic procedures for the identification of pathogenic bacteria.

471. Medical Parasitology
Spring. 2(1-2)
P: MIC 302. R: Open only to Microbiology or Medical Technology or Clinical Laboratory Sciences majors.
Biology and laboratory diagnosis of protozoan and helminth infections of humans.

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.
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 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 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 students and Microbiology majors.
A three-or-more semester 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.

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

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. Bacterial Diversity
Fall of odd-numbered years. 3(3-0)
P: BCH 461, 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.
Morphological and physiological properties of groups of bacteria. Relationship of those properties to ecological niche and importance.

828. Bacterial Diversity Laboratory
Fall of odd-numbered years. 2(0-6)
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

101. Leadership: The Military Profession
Fall, Spring. 1(1-1)
Analysis of military profession from several academic perspectives. Technical, ethical, and personal ramifications of officership. Introduction to military leadership. Lab introduces military skills.

102. Leadership: Land Navigation
Fall, Spring. 1(1-1)
Military topographic and special maps: intersection, resection, modified resection, and polar coordinates. Tactical operation overlays. Preview of small unit leader's role in the Army. Lab: use of lensatic compass.

201. Leadership Assessment Program, the Military Leader
Fall, Spring. 1(1-1)
Individual leadership development using standardized assessment technology. Administration, personal relations, and decision making. Military writing and professional obligations. Lab includes rappelling and marksmanship.

202. Leadership: First Aid/Fitness Training
Fall, Spring. 1(1-1)
Emergency first aid including casualty evaluation, lifesaving measures, CPR, and environmental injury prevention. Leader's role in implementing Army Physical Fitness Program. Individual and group fitness programs. Lab: hands on leadership training.

301. Leadership: Command and Control Communication
Fall, Spring. 3(3-2)
P: MS 202.
Wire and radio communications for tactical operations. Encryption/decryption, use of codes, and electronic warfare. Theories and models of behavioral sciences for leadership. Lab emphasizes communication skills.

302. Leadership: Small Unit Tactics
Fall, Spring. 3(3-2)
P: MS 301.
Military topographic and special maps: interesection, resection, modified resection, and polar coordinates. Tactical operation overlays. Preview of small unit leader's role in the Army. Lab: use of lensatic compass.

401. Leadership: Management
Fall, Spring. 3(2-3)
P: MS 302.
Army training personnel administration and logistics systems, and the leader's role as a trainer and effective manager. Oral and written communication. Leadership assessment and development. Lab: practical experience in unit administration.

402. Military Law, Ethics and Professionalism
Spring. 3(2-3)
P: MS 401.
Military legal system. Application of military justice. Fundamental values and principles of conduct in the profession of arms. Development of subordinates and the role of noncommissioned officers. Lab includes leadership development assessment.

490. Independent Study in Military Science
Fall, Spring. 1 to 4 credits. A student may earn a maximum of 4 credits in all enrollments for this course.
R: Open only to juniors and seniors. Approval of department.
Individual research in areas related to military science.

MUSIC MUS

School of Music
College of Arts and Letters

112. Chamber Music
Fall, Spring. 1(0-2) A student may earn a maximum of 10 credits in all enrollments for this course.
R: Audition required.
Rehearsal and performance of broad range of chamber music literature.

114. Marching Band
Fall. 1(0-9) A student may earn a maximum of 6 credits in all enrollments for this course.
R: Audition required.
Rehearsal and performance of broad range of marching band literature at football games.

115. Spartan Brass
Spring. 1(0-2) A student may earn a maximum of 6 credits in all enrollments for this course.
R: Audition required.
Rehearsal and performance of broad range of brass literature at basketball and hockey games.

116. Campus Band
Fall, Spring. 1(0-3) A student may earn a maximum of 10 credits in all enrollments for this course.
Rehearsal and performance of broad range of band literature chosen from baroque period to the present.

117. Concert Band
Fall, Spring. 1(0-3) A student may earn a maximum of 10 credits in all enrollments for this course.
R: Audition required.
Rehearsal and performance of broad range of wind literature from various historical periods and styles.

118. Wind Symphony
Fall, Spring. 1(0-6) A student may earn a maximum of 10 credits in all enrollments for this course.
R: Audition required.
Rehearsal and performance of broad range of wind literature from various periods and styles.

120. Symphony Orchestra
Fall, Spring. 1(0-6) A student may earn a maximum of 10 credits in all enrollments for this course.
R: Audition required.
Rehearsal and performance of symphonic and operatic repertoire.