MICROBIOLOGY AND MOLECULAR GENETICS MMG

Department of Microbiology and Molecular Genetics
College of Natural Science

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.

111L Cell and Molecular Biology Laboratory
Fall, Spring, Summer. 2(1-3) Interdepartmental with Biological Science and Plant Biology and Zoology. Administered by Biological 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.

201 Fundamentals of Microbiology
Spring. 3(3-0) RB: CEM 141 or ISP 201 or ISP 207 or ISP 209 or ISP 217 SA: MMG 105, MMG 205
Microbial structure, function, growth, control, and diversity. Role of microbes in health, industry, and the environment.

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 201 or concurrently) or (MMG 301 or concurrently) SA: MPH 302, MIC 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. Administered by Microbiology and Molecular Genetics. 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. Interdepartmental with Crop and Soil Sciences and Geological Sciences and Zoology. Administered by Microbiology and Molecular Genetics. 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.

434 Laboratory in Genomics and Molecular Genetics (W)
Fall. 3(1-6) P:M: ((MMG 301) and completion of Tier I writing requirement) and (MMG 431 or MMG 433) R: Open to students in the Genomics and Molecular Genetics.
Genomics and molecular genetic techniques using microbes. Collection and critical assessment of quantitative data and written communication of results.

440 Food Microbiology
Spring. 3(3-0) Interdepartmental with Food Science. Administered by Food Science. P:M: (MMG 201 or MMG 301) and completion of Tier I writing requirement. R: Not open to freshmen. SA: MPH 440
Major groups of microorganisms of importance to the food industry. Ecological, physiological, and public health aspects.

441 Food Microbiology Laboratory
Spring. 2(0-4) Interdepartmental with Food Science. Administered by Food Science. 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 301 or concurrently) 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 301 or concurrently) RB: 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 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: Open only to graduate-professional students in the 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.

559 Veterinary Microbiology and Immunology
Fall. 4(4-0) R: Open to graduate-professional students in the College of Veterinary Medicine. SA: MMG 561, MMG 567, MMG 569
Medically important properties of veterinary pathogens. Principles of positive and negative host response.

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. RB: 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. RB: 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. RB: 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. RB: 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.

801 Integrative Microbial Biology
Fall. 4(4-0) Not open to students with credit in MMG 821 or MMG 829 or MMG 841 or MMG 827.
Structural, metabolic, phylogenetic, and genomic diversity of microbes and microbial communities. Microbial ecology, evolution, and behavior. Regulation of gene expression. Microbial interactions with other microbes, animals, or plants

803 Topics in Integrative Microbial Biology
Fall, Spring. 2(2-0) A student may earn a maximum of 10 credits in all enrollments for this course. P:M: MMG 801 or concurrently
In-depth study of a particular topic from integrative microbial biology.

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
Fall of even years. 3(3-0) RB: MMG 421 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 and Physiology. Administered by 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.

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. Administered by Microbiology and Molecular 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.

840 Advanced Food Microbiology
Spring of even years. 4(4-0) Interdepartmental with Food Science. Administered by Food Science. RB: MMG 201 or MMG 301 Not open to students with credit in FSC 440.
In-depth discussion of major groups of microorganisms relevant to the food industry. Ecological, physiological and public health aspects.

841 Soil Microbiology
Spring of even years. 3(3-0) Interdepartmental with Crop and Soil Sciences. Administered by Microbiology and Molecular Genetics. 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 Plant Biology and Zoology. Administered by 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
Spring of odd 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 the College of Agriculture and Natural Resources or College of Engineering or College of Human Medicine or College of Natural Science or 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 the Department of Microbiology and Molecular Genetics. 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 24 credits. A student may earn a maximum of 120 credits in all enrollments for this course. R: Open only to graduate students in the Microbiology and Molecular Genetics major. SA: MPH 999
Doctoral dissertation research.