MICROBIOLOGY MMG AND MOLECULAR GENETICS

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.

Cell and Molecular Biology Laboratory 111L

Fall, Spring, Summer. 2(1-3) Interdepart-mental with Biological Science and Plant Biology and Zoology. Administered by Biologi-cal 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.

Fundamentals of Microbiology 201

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.

Advanced Microbiology Laboratory (W) Fall. 3(1-6) P:M: (MMG 302 and MMG 431 408 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 coor-dinate 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 concurrent-ly) 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 Mi-crobiology and Molecular Genetics. RB: (BS LISS 145 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.

Food Microbiology 440

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.

Basic Biotechnology 445

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.

Medical Microbiology 463

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.

Diagnostic Microbiology Laboratory 464

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 Biolo-gy/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

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 on Sector 2014 MDU 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.

Medical Microbiology and Immunology Spring. 5(4-2) R: Open only to graduate-professional students in the colleges of Hu-522

man 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 graduateprofessional 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 graduateprofessional 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.

Veterinary Clinical Bacteriology 660 Clerkship

Fall, Spring, Summer. 3 credits. RB: Completion of semester 5 of the graduateprofessional 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 graduateprofessional 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 graduateprofessional 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.

Integrative Microbial Biology 801

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

Topics in Integrative Microbial Biology 803

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.

Molecular Virology 813

research.

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

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.

Cell Structure and Function 825

Spring. 3(3-0) Interdepartmental with Bio-chemistry and Molecular Biology and Physi-Molecular Biology and Physi-ology. 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.

Microbial Genetics 833

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.

Soil Microbiology 841

Spring of even years. 3(3-0) Interdepart-mental with Crop and Soil Sciences. Admi-nistered by Microbiology and Molecular Genetics. RB: MMG 425 SA: MPH 841 Ecology, physiology, and biochemistry of microor-

ganisms 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.