Microbiology and Molecular Genetics

Department of Microbiology and Molecular Genetics

College of Natural Science

103 Frontiers of Microbiology and Molecular Genetics
Spring. 1(2-0) R: Open to freshmen or sophomores.
Current microbiology research. Significance to modern biological science and impact on society.

161 Cell and Molecular Biology
Fall, Spring, Summer. 2(1-3) Interdepartmental with Biochemistry and Molecular Biology. Administered by Biological Science. P: (CEM 141 or concurrently) or (CEM 151 or concurrently) or (LB 171 or concurrently) or (CEM 161H or concurrently) or (CEM 191H or concurrently) or (LB 145H or concurrently) or (LSB Environmental Biology or Plant Biology). SA: BS 111L, BS 159H. Not open to students with credit in BS 181H or LB 145.


171 Cell and Molecular Biology Laboratory
Fall, Spring, Summer. 2(1-3) Interdepartmental with Biological and Molecular Biology. Administered by Biological Science. P: (CEM 141 or concurrently) or (CEM 151 or concurrently) or (CEM 161H or concurrently) or (CEM 181H or concurrently) or (CEM 191H or concurrently) or (LSB Environmental Biology or Plant Biology). SA: BS 111L, BS 159H. Not open to students with credit in BS 191H or LB 145.

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

181H Honors Cell and Molecular Biology
Spring. 3(3-0) Interdepartmental with Biochemistry and Molecular Biology. Administered by Biological Science. P: (CEM 141 or concurrently) or (CEM 151 or concurrently) or (CEM 161H or concurrently) or (CEM 181H or concurrently) or (CEM 191H or concurrently) or (LSB Environmental Biology or Plant Biology). SA: BS 111L, BS 159H. Not open to students with credit in BS 161 or LB 145.

Physicochemical and molecular organization of cells as the unifying framework for genetics, evolution, and the social relevance of biology.

191H Honors Cell and Molecular Biology Laboratory
Spring. 2(1-3) Interdepartmental with Biochemistry and Molecular Biology. Administered by Biological Science. P: (CEM 141 or concurrently) or (CEM 151 or concurrently) or (CEM 161H or concurrently) or (CEM 181H or concurrently) or (CEM 191H or concurrently) or (LSB Environmental Biology or Plant Biology). SA: BS 111L, BS 159H. Not open to students with credit in BS 171 or LB 145.

Basic techniques of cellular and molecular biology including experimental design and hypothesis formulation; biochemistry, molecular biology and genetics.

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: (BS 161 or LB 145 or BS 181H) and ((CEM 251 or concurrently) or (CEM 351 or concurrently) or (CEM 143 or concurrently)) SA: MIC 301

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

302 Introductory Laboratory for General and Allied Health Microbiology
Spring. 1(0-3) P: (MMG 201 or concurrently) or (MMG 301 or concurrently) SA: MIC 302

Methodology of microbiology. Microscopy, staining, aseptic technique, media, quantification, diagnostics, and laboratory safety.

400 Introduction to Bioinformatics
Spring of odd years. 3(2-2) Interdepartmental with Biochemistry and Molecular Biology and Plant Biology. Administered by Plant Biology. P: (STT 200 or STT 201 or STT 231 or STT 421) and (PLB 203 or MMG 201 or BMB 200) RB: An introductory biology course covering basic genetics, macromolecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variables, distributions, and basic probability theory is recommended for biology majors.

Bioinformatic theory and practice. How to manage and analyze sequences, structures, gene expression, and other types of biological data.

404 Human Genetics
Spring. 3(3-0) P: (ZOL 341) and (BMB 401 or concurrently or BMB 461 or concurrently) and completion of Tier I writing requirement. SA: ZOL 344, ZOL 404


408 Advanced Microbiology Laboratory (W)
Fall. 3(1-6) P: (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 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: (BS 161 or LB 145 or BS 181H) 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: (BMB 462 or concurrently) or BMB 401


421 Prokaryotic Cell Physiology
Fall. 3(3-0) P: (MMG 301 and (BMB 461 or concurrently)) or (MMG 301 and BMB 401 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.

431 Microbial Genetics
Fall. 3(3-0) P: (BMB 461 or concurrently) or (BMB 401 or concurrently) SA: 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: (MMG 431) RB: (BMB 421 or BMB 461) and CSE 101


434 Laboratory in Genomics and Molecular Genetics (W)
Spring. 3(1-6) P: ((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: (MMG 201 or MMG 301) and completion of Tier I writing requirement. R: Not open to freshmen.

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: (FSC 440 or concurrently) and completion of Tier I writing requirement. RB: 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 Microbial Biotechnology (W)
Fall, Summer. 3(3-0) P: (MMG 301 or BMB 461 or BMB 401) and completion of Tier I writing requirement SA: MIC 445

Applications of microbial products and processes in areas such as biopharmaceuticals, bioremediation, biocatalysis and other green chemistries.
451 Immunology
Fall. 3(3-0) P: (BS 161 or LB 145 or BS 181H) and (BMB 401 or concurrently) or (BMB 461 or concurrently)) SA: MPH 451
Not open to students with credit in BLD 434. 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 of even years. 3(3-0) P: (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) Interdepartmental with Biomedical Laboratory Diagnostics. Administered by Microbiology and Molecular Genetics. P: MMG 301 or (MMG 201 and BS 161) or (MMG 201 and LB 145) or (MMG 201 and BS 181H) RB: MMG 451 or BLD 434 R: Open to juniors or seniors in the Biomedical Laboratory Diagnostics Program or in the Department of Microbiology and Molecular Genetics or in the Biomedical Laboratory Science Major or in the Lyman Briggs Biomedical Laboratory Science Coordinator Major or in the Lyman Briggs Environmental/Biology/Microbiology Coordinator Major or in the Environmental Biology/Microbiology Coordinator Major or in the Genomics and Molecular Genetics Coordinator Major or in the Lyman Briggs Genomics and Molecular Genetics Coordinator Major or in the Lyman Briggs Human Biology Coordinator Major or in the Human Biology Coordinator Major or in the Microbiology Coordinator Major or in the Lyman Briggs Microbiology Coordinator Major. SA: MIC 463
Properties of pathogenic bacteria and viruses and their mechanisms of pathogenicity and clinical diagnoses.

464 Diagnostic Microbiology Laboratory
Fall. 2(0-4) Interdepartmental with Biomedical Laboratory Diagnostics. Administered by Microbiology and Molecular Genetics. P: MMG 463 or concurrently R: Open to juniors or seniors in the Department of Microbiology and Molecular Genetics or in the Biomedical Laboratory Diagnostics Program or in the Clinical Laboratory Sciences major. SA: MIC 464
Clinical laboratory 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 and Molecular Genetics
Spring, 3(3-0) R: Open to seniors in the Lyman Briggs College or in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Genomics and Molecular Genetics Coordinator Major. SA: MIC 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(2-0) P: MMG 489 or MMG 499H R: Open to students in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Genomics and Molecular Genetics Coordinator Major. SA: MIC 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 to students in the Department of Microbiology and Molecular Genetics or in the Lyman Briggs Genomics and Molecular Genetics Coordinator Major. SA: MIC 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 to students in the Department of Microbiology and Molecular Genetics and open to students in the Lyman Briggs College. SA: MIC 499H Research project with thesis and oral report. A portion of Microbiology or Genomics and Molecular Genetics capstone experience.

522 Medical Microbiology and Immunology
Spring. 5(4-2) R: Open to graduate-professional students in the College of Osseopath Medicine or in the College of Human Medicine.
Basic principles of microbiology (bacteriology, virology, mycology and parasitology) and immunology and their relation to disease in humans.

531 Medical Immunology
Fall. 2(2-0) R: Open to graduate-professional students in the College of Osseopath Medicine.
Basic principles of immunology. Overview of concepts and terminology in relation to human disease defenses.

532 Medical Microbiology
Fall. 2(1-2) R: Open to graduate-professional students in the College of Osseopath Medicine.
Basic principles of microbiology including bacteriology, virology, mycology, and parasitology and their relationship 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.

563 Veterinary Pathogenic Microbiology: Bacteria and Fungi
Fall. 3(3-0) RB: Completion of Year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. SA: MMG 567 Etiology, pathogenesis, transmission, pathogenicity, host response, therapy, and control of bacterial and fungal diseases of animals.

565 Veterinary Pathogenic Microbiology: Viruses
Spring. 2(2-0) R: Completion of Year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. SA: MMG 569 Etiology, pathogenesis, pathogenicity, transmission, diagnosis, host response, therapy, and control of selected viral diseases of animals.

571 Veterinary Pathogenic Microbiology: Parasites
Spring. 3(2-2) R: Open to graduate-professional students in the College of Veterinary Medicine. SA: MMG 569 Etiology, pathogenesis, transmission, pathogenicity, diagnosis, host response, therapy, and control of selected parasitic diseases of animals.

631 Veterinary Medical Genetics
Spring. 1(1-0) R: Completion of Year 1 of the graduate-professional program in the College of Veterinary Medicine. R: Open to graduate-professional students in the College of Veterinary Medicine. SA: SCS 562 Mechanisms, recognition, diagnosis, and control of genetics diseases in veterinary medicine.

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.

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: MMG 801 or concurrently
In-depth study of a particular topic from integrative microbial biology.
810 Theories and Practices in Bioinformatics
Spring of even years. 3(2-2) Interdepartmental with Biochemistry and Molecular Biology and Plant Biology. Administered by Plant Biology, RB: Basic genetics, macro-molecules, evolution, energy metabolism, genetic materials, and signal transduction is recommended for non-biology majors. A statistic course covering random variable, distributions, and basic probability theory is recommended for biology majors. Theories and algorithms behind bioinformatics tools. Basic tool development by writing scripts in the Python programming language for data analysis.

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.

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.

837 Human Molecular Genetics
Fall of odd years. 3(3-0) RB: MMG 835 or comparable background in genetics. Discovery and function of genetic factors involved in human diseases and traits. Biological and clinical questions addressed by human genetic analyses and the types of approaches used.

845 Multi-disciplinary Research Methods for the Study of Evolution
Spring, 3(3-0) Interdepartmental with Computer Science and Engineering and Zoology. Administered by Computer Science and Engineering. Techniques for engaging in multi-disciplinary research collaborations, including biology, computer science, and engineering. Students engage in group projects to answer fundamental questions about the dynamics of actively evolving systems including both natural and computational. Multi-disciplinary teams will learn to overcome discipline-specific language and conceptual issues. Experimental design, statistical analysis, data visualization, and paper and grant writing for multi-disciplinary audiences.

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.

891 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 36 credits in all enrollments for this course. R: Open to graduate students in the Genetics Major or in the Microbiology and Molecular Genetics Major. Doctoral dissertation research.