# MB - Microbiology

**MB 505 Host-Associated Microbiomes: 4 Credits (3 Lec, 1 Lab)**
PREREQUISITE: BIOB 160; CHMY 123; BCH 380; BIOM 360. This course will introduce students to the microbial ecosystems that colonize human and animal hosts, detailing their essential roles in host nutrition, health and development. Students will also be exposed to modern molecular techniques used to study these systems

**MB 510 Immunology: 4 Credits (4 Lec)**
PREREQUISITE: graduate level standing. Fundamentals of cellular and molecular immunology including consideration of structure, genetics and function of immunoglobulin, T-cell receptors and major histocompatibility antigens; regulation of the immune response; transplantation and immunological diseases

**MB 515 Microbial Ecology: 3 Credits (3 Lec)**
Critical review of literature on the distribution and activity of microorganisms in natural microbial communities based on microbial adaption and physical, chemical and biological features of the microenvironment. A critical discussion of literature and approaches. Cross-listed with LRES 515.

**MB 519 Programming for Biologists: 3 Credits (2 Lec, 1 Lab)**
This course will introduce computer programming languages commonly used in the biological sciences, including Python, R, and command line driven applications. Common commands in each programming language/application will be covered in the context of biological problem-solving using manipulation and analysis of large datasets.

**MB 520 Microbial Physiology: 3 Credits (3 Lec)**
PREREQUISITE: BIOM 360 and BCH 380. An in-depth examination of microbial cell structure and function, bioenergetics, and intermediary metabolism and control. Students will also be expected to consider biochemical function within the context of genomic sequences, and be able to formulate predictions for carbon and energy flow

**MB 525 Advanced Immunology: 3 Credits (3 Lec)**
PREREQUISITE: BIOB 410. Recent advances in immunochemistry, immunogenetics, immunopathology, molecular and cellular immunology. Cross-listed with VTMB 501

**MB 527 Toxicology: 3 Credits (3 Lec)**
This course introduces mechanisms of toxicity; effects of toxicants on major organ systems. major classes of toxicants; absorption, distribution, biotransformation and elimination of toxicants. Human exposure to drugs of abuse and environmental agents, case studies, and risk assessment are discussed. Co-convened with BIOM 425.

**MB 528 Advanced Genetics: 3 Credits (3 Lec)**
PREREQUISITE: BIOM 450 or consent of instructor. PREREQUISITE: BIOM 450 or equivalent. Recent advances in microbial genetics with an emphasis on molecular genetics and eukaryotic gene expression

**MB 530 Virology: 3 Credits (3 Lec)**
PREREQUISITE: BIOB 160 or BIOB 260 or BIOB 375 or BIOH 320 or BCH 380 or BCH 442 or BCH 444R. Fundamentals of virology with emphasis on animal viruses of medical importance. Molecular aspects of structure, replication transmission and host response to viral infection will be covered

**MB 533 Current Topics in Microbiology for Teachers: 3 Credits (1 Lec, 1 Lab, 1 Other)**
This course will provide an inquiry based examination of current microbiology related topics. Topics may vary from semester to semester and will be selected by the assessment of what is considered "newsworthy." Topics could include but not be limited to hospital acquired and community acquired infections, antibiotic resistance, immunizations, food safety and drinking water. Emphasis will be placed on the ramifications of issues with respect to industry, medicine, and personal health. A review of literature will provide background information for the topics in order to provide teachers sufficient and correct information to hold discussions regarding these topics in their classrooms. Offered Spring.

**MB 535 Genomic Analysis Lab: 4 Credits (3 Lec, 1 Lab)**
PREREQUISITE: Permission of instructor needed. The quantity of sequence information deposited into databases necessitates that scientists train in both discovery and hypothesis-based research that utilizes these resources. This class will cover experimental design, database searching and management, sequence alignment, molecular pattern recognition, and phylogenetics. PREREQUISITE: Permission of instructor needed. The quantity of sequence information deposited into databases necessitates that scientists train in both discovery and hypothesis-based research that utilizes these resources. This class will cover experimental design, database searching and management, sequence alignment, molecular pattern recognition, and phylogenetics

**MB 536 Exploring Microbiology: 3 Credits (3 Other)**
Explore microscopy, prokaryotes, microbial eukaryotes, viruses, acellular agents, microbial evolution, diversity, by focusing on an experimental microcosm. Ideal for middle/high school/lower level college teachers and others in education and outreach roles, e.g. museums, zoos, National Parks, nature preserves, environmental health. Offered Spring.

**MB 538 Cell & Molecular Biol: 2 Credits (2 Lab)**
An inquiry-based laboratory in prokaryotic and eukaryotic CMB provides training in microbiological techniques: recombinant DNA, phylogenetic analyses, growth, cell cycle regulation, gene expression, protein purification, and immunoassays. Current literature and laboratory discussions cover molecular approaches for investigating complex cellular mechanisms. Offered Summer.

**MB 539 Infection and Immunity: 3 Credits (3 Other)**
An inquiry-based study of recent advances in understanding the etiology, pathogenesis, chemotherapy and prevention of infectious disease which includes analysis of current literature, case histories, and online sources of information. This course is intended for practicing teachers and those in the MSSE program. Offered Fall.

**MB 540 Environmental Microbiology: 3 Credits (3 Other)**
Biotechnology, industrial microbiology, antimicrobial chemotherapy, public health, epidemiology, climate change, food water, wastewater, extreme environments, space travel, biodegradation, bioremediation and bioaugmentation. Ideal for middle/high school/college teachers, and others in education/outreach, e.g., museums, zoos, National Parks, nature preserves, environmental health. Offered Summer.

**MB 541 Microbial Genetics: 3 Credits (3 Lec)**
Prokaryotes provide much of the understanding of fundamental genetics for all organisms, especially through in vivo and in vitro genetic tools. Transcription, translation, mutation and recombination are considered, so that science teachers understand of fundamentals of genetics. This course is intended for practicing teachers and those in the MSSE program. Offered Summer.

**MB 542 Microbial Ecology: 3 Credits (3 Lec)**
PREREQUISITE: MB 536 or equivalent course or BS in Biology
COREQUISITE: BS in biology or equivalent; Graduate standing or petition approval from the Vice Provost of Graduate Education.
Ecology of microorganisms, their nutrition, growth, control, metabolism, biogeochemical cycling, natural environments, habitats and interactions. Centered on an experiment, this discovery-based course is ideal for middle/high school/lower level college teachers, and others in education/outreach roles, e.g., nature facilities, environmental health. Offered Fall
Ecology of microorganisms, their nutrition, growth, control, metabolism, biogeochemical cycling, natural environments, habitats and interactions. Centered on an experiment, this discovery-based course is ideal for middle/high school/lower level college teachers, and others in education/outreach roles, e.g., nature facilities, environmental health.

**MB 544 Advanced Bioinformatics: 4 Credits (3 Lec, 1 Lab)**
This course will cover advanced topics in Bioinformatics, including genome assemblies and functional annotations of proteins. The course is meant to support experimental work by training students to make confident predictions from biological sequences and to develop testable hypotheses that will guide their experimental work. Students will learn about using local and worldwide prediction servers.

**MB 547 Thermal Biology of YNP: 2 Credits (1 Lec, 1 Lab)**
Thermal Biology, an interdisciplinary science that incorporates biology, geology, and chemistry to discover where and under what conditions life can exist in the thermal features of Yellowstone National Park. As such, it lends itself easily to incorporation to most science curricula. The two goals of this are to: 1)provide a basic understanding of the ecology of a variety of life forms and their thermal habitats, and 2) provide a survey of observational techniques and hands-on activities appropriate for science educators. -.

**MB 552 Adv Soil & Env Microbiology: 3 Credits (3 Lab)**
PREREQUISITE: BIOM 452 or consent of instructor. Advanced laboratory course. Microorganisms are targeted for isolation and characterization, emphasizing those not normally encountered in general microbiology laboratory. Biochemical cycling, contaminant biodegradation, extremophiles, and plant-microbe interactions are typical topics is investigated. Students employ classic and novel cultivation approaches, identifying microbes based morphology, physiology, and phylogeny. Cross-listed with LRES 552

**MB 560 Infectious Disease Ecology & Spillover: 3 Credits (3 Lec)**
PREREQUISITE: Background in Microbiology, Immunology, Ecology, by consent of instructor. Disease Ecology is highly interdisciplinary and merges concepts from microbiology, immunology, ecology, evolution, mathematics, epidemiology, medicine, veterinary medicine, and geography. Thus this discipline is positioned to address major global health issues. Students will study questions such as: What factors, across molecular to landscape scales, must align to allow pathogens to jump from animals to humans? Why is monkeypox spillover increasing in West Africa as immunity to smallpox wanes? Why do wolves experience periodic outbreaks of distemper in Yellowstone? Why did Ebola recently spread through multiple West African countries, whereas previous outbreaks were restricted to small regions in Central Africa?

**MB 575 Professional Paper: 1-4 Credits (1-4 Other)**
PREREQUISITE: Graduate standing and committee approval. A research or professional paper or project dealing with a topic in the field. The topic must have been mutually agreed upon by the student and his or her major adviser and graduate committee
Repeatable up to 6 credits.

**MB 589 Graduate Consultation: 1-3 Credits (1-3 Other)**
PREREQUISITE: Master's standing and approval of the Dean of Graduate Studies. This course may be used only by students who have completed all of their coursework (and thesis, if on a thesis plan) but who need additional faculty or staff time or help

**MB 590 Master's Thesis: 1-10 Credits (1-10 Other)**
PREREQUISITE: Master's standing
Repeatable up to 20 credits.

**MB 591 Special Topics: 1-4 Credits (1-4 Other)**
PREREQUISITE: Upper division courses and others as determined for each offering. Courses not required in any curriculum for which there is a particular one time need, or given on a trial basis to determine acceptability and demand before requesting a regular course number

**MB 592 Modeling infectious disease dynamics: 1-3 Credits (1-3 Lec)**
In this special unit of study, students will learn how to model the spread of an infectious disease through a population. We will build susceptible-infectious-recovered models in R and simulate an epidemic. Students will learn how changing the critical parameters changes the dynamics of disease. They will also experience how fundamental assumptions, such as density and frequency dependence, influence dynamics.
Repeatable up to 6 credits.

**MB 594 Seminar: 1 Credits (1 Other)**
PREREQUISITE: Graduate standing or seniors by petition. Course prerequisites as determined for each offering. Topics offered at the graduate level which are not covered in regular courses. Students participate in preparing and presenting discussion material. There are separate sections for departmental seminar, general/environmental and biomedical microbiology journal clubs and graduate reading; consult the Department of Microbiology Graduate Student Handbook for specific requirements
Repeatable up to 4 credits.

**MB 598 Internship: 2-12 Credits (2-12 Other)**
PREREQUISITE: Graduate standing, consent of instructor and approval of department head. An individualized assignment arranged with an agency, business or other organization to provide guided experience in the field
Repeatable up to 99 credits.

**MB 690 Doctoral Thesis: 1-10 Credits (1-10 Other)**
PREREQUISITE: Doctoral standing
Repeatable up to 30 credits.