

# MICROBIOLOGY

The Department of Microbiology is part of the School of Life Sciences.

Microbiology is concerned with the forms and activities of bacteria, archaea, fungi, protozoa, and viruses. It plays varied roles in the practical applications of technology and medicine, as well as in the most theoretical problems of biology. Microbiologists are involved in activities as different as the study of gene structure, the control of disease, and the industrial processes based on the ability of microorganisms to decompose and synthesize complex organic molecules. Microbiology is one of the most rewarding of professions because it provides the opportunity to be in contact with all the other natural sciences and thus to contribute in many different ways to the betterment of life.

## Undergraduate Studies in Microbiology

Many fields of microbiology are available to students and research workers. These include fundamental areas such as the physiology, ecology, and genetics of microorganisms; and the applications of microbiology concerned with soil and water quality, food safety, immunology, and human, animal and plant diseases. Undergraduate studies prepare students for admission to professional schools, graduate programs in microbiology, and for positions in education and as health officers, sanitarians and biotechnicians in private industry, state and federal government.

High school students or community college transferees considering a career in microbiology will find it helpful to have a strong background in mathematics and chemistry. An excellent advising program is available to undergraduates, and prospective students are encouraged to consult with a departmental advisor or with faculty members working in an area of interest to them. Upper-division students are also encouraged to carry out a research project in the laboratory of a faculty member and/or to serve as an undergraduate teaching assistant. Several partial scholarships are available for microbiology majors. For more information, contact a microbiology advisor.

## Undergraduate Studies in BioHealth Sciences

Specialized programs are offered to students who wish to pursue careers in health-related fields. Such programs provide excellent academic preparation for students who plan to enter medical, pharmacy, or dental school, and for those choosing careers in physician assistant, physical therapy, optometry, clinical laboratory science, and podiatry. The curricula of the BioHealth Sciences major and accompanying options generally fulfill requirements at the respective professional schools. Because specific requirements vary from school to school, it is the student's responsibility to check requirements for any school to which the student plans to apply.

## Graduate Studies

The Department of Microbiology offers graduate programs leading to the Master of Science and Doctor of Philosophy degrees. Major fields of study in the program include molecular biology, microbial physiology, genetics, virology, soil and aquatic microbiology, immunology, pathogenic microbiology, and microbial genomes. The department also participates in the Master of Arts in Interdisciplinary Studies program. Students in both the master's and PhD programs are required to complete a research project leading to a thesis. Students pursuing the PhD degree must

complete both written and oral qualifying examinations. Teaching and research assistantships are available.

For additional information, contact the department head or other faculty members conducting research in areas that are of interest.

## Undergraduate Programs

### Major

- BioHealth Sciences (<http://catalog.oregonstate.edu/college-departments/science/school-life-sciences/microbiology/biohealth-sciences-bs-hbs/>)

#### Options:

- *Pre-Clinical Laboratory Science*
  - *Pre-Dentistry*
  - *Pre-Medicine/Pre-Podiatry*
  - *Pre-Optometry*
  - *Pre-Pharmacy*
  - *Pre-Physical Therapy*
  - *Pre-Physician Assistant*
  - Microbiology (<http://catalog.oregonstate.edu/college-departments/science/school-life-sciences/microbiology/microbiology-bs-hbs/>)
- #### Options:
- *Aquatic Microbiology*
  - *Pre-Medicine/Microbiology*

### Minor

- Microbiology (<http://catalog.oregonstate.edu/college-departments/science/school-life-sciences/microbiology/microbiology-minor/>)

## Graduate Programs

### Major

- Microbiology (<http://catalog.oregonstate.edu/college-departments/science/school-life-sciences/microbiology/microbiology-ma-ms-phd/>)

### Minor

- Microbiology (<http://catalog.oregonstate.edu/college-departments/science/school-life-sciences/microbiology/microbiology-graduate-minor/>)

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## Faculty

**Professors** Bartholomew, Bermudez, Field, Giovannoni, Kent, Sarker, Schuster, Trempey

**Emeritus Faculty**, Bottomley, Dreher, Geller, Ream, Rohrmann

**Associate Professors** Vega-Thurber, Halsey, Mueller, Sharpton

**Assistant Professors** David, Thurber, Lowry

**Senior Instructor 2** Bruslind

**Instructor** Evans, Hokanson, Massoni

Professional Faculty Beck, Bolman

## BioHealth Sciences (BHS)

### BHS 107, HEALTH PROFESSIONS: DENTAL, 1 Credit

Discussion of matters relating to a dental career. Includes application procedures, the importance of various requirements, admissions, professional school curricula, financing education and related matters. Speakers are included. Graded P/N.

### BHS 110, BIOHEALTH SCIENCES ORIENTATION, 1 Credit

Introduction of incoming BioHealth Sciences students to college life with an emphasis on faculties, facilities, services, and curricula in BHS. Exposure to career opportunities for students interested in the BioHealth Sciences. Graded P/N.

### BHS 199, SPECIAL TOPICS, 1-16 Credits

Graded P/N.

**Equivalent to:** GS 199

*This course is repeatable for 16 credits.*

### BHS 211, PROFESSIONAL DEVELOPMENT II: MOLECULAR, MICROBIAL, BIOHEALTH, 1 Credit

Develop awareness of the elements of professional development, identify strategic areas for growth, and design an exploration plan. Emphasis is placed on being able to analyze career opportunities to determine the best mix of technical and professional skills needed for success as a biological science professional. Graded P/N. CROSSLISTED as BB 211/ BHS 211.

**Equivalent to:** BB 211

### BHS 255, \*ALLIED HEALTH MICROBIOLOGY, 4 Credits

General properties of cellular microbes and viruses, microbial biochemistry and genetics, pathogenesis and disease, immunity, and microbial infections. Lecture and lab emphasis is on medical microbiology, infectious diseases, and public health. Not intended for biological sciences majors. Lec/lab. CROSSLISTED as BHS 255/MB 255.

**Attributes:** CPBS – Core, Pers, Biological Science

**Equivalent to:** MB 255

*Available via Ecampus*

### BHS 316, PRINCIPLES OF IMMUNOLOGY, 3 Credits

Interactions of the innate and adaptive immune responses in the context of infectious diseases, autoimmune diseases, immunodeficiencies and immunotherapies. This course is designed for non-microbiology majors.

**Prerequisite:** MB 230 with C- or better or ((BI 212 with C- or better or BI 212H with C- or better) and (BI 213 [C-] or BI 213H [C-])) or (BI 204 [C-] and BI 205 [C-]) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]))

*Available via Ecampus*

### BHS 320, HUMAN BACTERIOLOGY, 4 Credits

Properties of bacteria, their biology, pathogenesis and concern to society. Emphasis on the role of bacteria in human health and disease. CROSSLISTED as BHS 320/MB 320.

**Prerequisite:** (BI 204 with C- or better and BI 205 [C-] and BI 206 [C-]) or ((BI 211 [C-] or BI 211H [C-]) and (BI 212 [C-] or BI 212H [C-]) and (BI 213 [C-] or BI 213H [C-])) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]) and (BI 223 [C-] or BI 223H [C-]))

**Equivalent to:** MB 320

*Available via Ecampus*

### BHS 323, ^MICROBIAL INFLUENCES ON HUMAN HEALTH, 3 Credits

How microorganisms contribute in beneficial and detrimental ways to human health. Emphasis on microbial contributions to cancer, gut health, chronic infection and autoimmune diseases. This course is part of the Writing Intensive Curriculum for the BioHealth Sciences major. (Writing Intensive Course)

**Attributes:** CWIC – Core, Skills, WIC

**Prerequisite:** MB 302 with D- or better or (BB 314 with D- or better or BB 314H with D- or better) or BB 450 with D- or better

*Available via Ecampus*

### BHS 329, MECHANISMS OF DISEASE: INTRODUCTION TO GENERAL PATHOLOGY, 3 Credits

An introduction to basic principles of disease, focused on structural and functional changes of cells, tissues and organs, and their relationships to clinical disease. The emphasis of the course is at the cellular to organ level, but will cover some on molecular mechanisms as pertinent.

**Prerequisite:** ((BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-])) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]))

*Available via Ecampus*

### BHS 340, HUMAN VIROLOGY, 4 Credits

Properties of viruses, their biology, pathogenesis and concern to society. Emphasis on viruses causing human disease. CROSSLISTED as BHS 340/MB 340.

**Prerequisite:** (BI 204 with C- or better and BI 205 [C-] and BI 206 [C-]) or ((BI 211 [C-] or BI 211H [C-]) and (BI 212 [C-] or BI 212H [C-]) and (BI 213 [C-] or BI 213H [C-])) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]) and (BI 223 [C-] or BI 223H [C-]))

**Equivalent to:** MB 340

*Available via Ecampus*

### BHS 401, RESEARCH, 1-16 Credits

**Equivalent to:** GS 401

*This course is repeatable for 16 credits.*

### BHS 403, THESIS, 1-16 Credits

**Equivalent to:** GS 403

*This course is repeatable for 16 credits.*

### BHS 405, READING AND CONFERENCE, 1-16 Credits

**Equivalent to:** GS 405

*This course is repeatable for 16 credits.*

**BHS 406, PROJECTS, 1-16 Credits**

Graded P/N.

*This course is repeatable for 16 credits.*

**BHS 407, SEMINAR, 1-16 Credits**

Graded P/N.

**Equivalent to:** GS 407

*This course is repeatable for 16 credits.*

**BHS 410, SCIENCE INTERNSHIP, 1-12 Credits**

Supervised scientific work experience at selected cooperating institutions, agencies, laboratories, or companies. Graded P/N.

**Equivalent to:** GS 410

*This course is repeatable for 12 credits.*

**BHS 415, ONE HEALTH IN PRACTICE, 3 Credits**

One health is the concept that human, animal and environmental health are all intertwined. Utilizes current one health issues such as disease outbreaks and antimicrobial resistance to encourage students from diverse fields to develop interdisciplinary collaboration and communication skills. CROSSLISTED as BHS 415/VMB 415.

**Equivalent to:** VMB 415

**Recommended:** At least third-year standing.

**BHS 499, SPECIAL TOPICS, 1-16 Credits**

Graded P/N.

*This course is repeatable for 16 credits.*

**General Science (GS)****GS 199, SPECIAL STUDIES, 1-16 Credits**

**Equivalent to:** BHS 199

*This course is repeatable for 16 credits.*

**GS 399, SPECIAL TOPICS, 1-16 Credits**

*This course is repeatable for 16 credits.*

**GS 401, RESEARCH, 1-16 Credits**

**Equivalent to:** BHS 401

*This course is repeatable for 16 credits.*

**GS 403, THESIS, 1-16 Credits**

**Equivalent to:** BHS 403

*This course is repeatable for 16 credits.*

**GS 405, READING AND CONFERENCE, 1-16 Credits**

**Equivalent to:** BHS 405

*This course is repeatable for 16 credits.*

**GS 407, SEMINAR, 1-16 Credits**

One-credit sections. Graded P/N.

**Equivalent to:** BHS 407

*This course is repeatable for 16 credits.*

**GS 410, SCIENCE INTERNSHIP, 1-12 Credits**

Supervised scientific work experience at selected cooperating institutions, agencies, laboratories, or companies. Graded P/N.

**Equivalent to:** BHS 410

*This course is repeatable for 12 credits.*

**Microbiology (MB)****MB 110, ORIENTATION TO MICROBIOLOGY, 1 Credit**

Introduction of incoming microbiology students to college life with an emphasis on faculties, facilities, services, and curricula in microbiology. Exposure to career opportunities in microbiology. Graded P/N.

**MB 201, LABORATORY SKILLS, 1-16 Credits**

These credits are designed for students who are doing experiential learning in a research laboratory on campus, performing basic laboratory tasks that are not elevated to the level of an independent research project. Graded P/N.

*This course is repeatable for 16 credits.*

**MB 230, \*INTRODUCTORY MICROBIOLOGY, 4 Credits**

Microbiology as it affects our everyday lives. The impact of microorganisms on health, food/water sanitation, environment, industry, and genetic engineering. Lec/lab. (Bacc Core Course)

**Attributes:** CPBS – Core, Pers, Biological Science

**Equivalent to:** MB 230H

*Available via Ecampus*

**MB 255, \*ALLIED HEALTH MICROBIOLOGY, 4 Credits**

General properties of cellular microbes and viruses, microbial biochemistry and genetics, pathogenesis and disease, immunity, and microbial infections. Lecture and lab emphasis is on medical microbiology, infectious diseases, and public health. Not intended for biological sciences majors. Lec/lab. CROSSLISTED as BHS 255/MB 255.

**Attributes:** CPBS – Core, Pers, Biological Science

**Equivalent to:** BHS 255

*Available via Ecampus*

**MB 290, SUCCESS IN MICROBIOLOGY, 1 Credit**

Science skills, science literacy, ethics, and professional development to build a successful career in Microbiology. Learn the process of research, access and analyze primary literature, evaluate user-generated science content, practice professional skills, and identify and plan for experience-building opportunities such as jobs, research and internships. Sophomore standing or higher.

**MB 299, SPECIAL TOPICS, 1-16 Credits**

May be repeated for credit when topic varies.

**Equivalent to:** MB 299H

*This course is repeatable for 16 credits.*

## MB 299H, SPECIAL TOPICS, 1-16 Credits

May be repeated for credit when topic varies.

**Attributes:** HNRS – Honors Course Designator

**Equivalent to:** MB 299

*This course is repeatable for 16 credits.*

## MB 302, GENERAL MICROBIOLOGY, 3 Credits

Emphasis on cytology, physiology, virology, growth and control of growth with coverage of the role of microorganisms in nature, in disease, and as useful tools.

**Prerequisite:** (CH 332 with C- or better or CH 335 with C- or better) and ((BI 212 with C- or better or BI 212H with C- or better) and (BI 213 [C-] or BI 213H [C-])) or (BI 204 [C-] and BI 205 [C-] and BI 206 [C-]) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]))

*Available via Ecampus*

## MB 303, GENERAL MICROBIOLOGY LABORATORY, 2 Credits

Development of laboratory techniques; exercises designed to reinforce concepts covered in MB 302. MB 302 is a prereq that may be taken prior to or concurrently with MB 303. Lec/lab.

**Prerequisite:** MB 302 (may be taken concurrently) with D- or better

**Equivalent to:** MB 303H

**Recommended:** Two terms organic chemistry

## MB 310, BACTERIAL MOLECULAR GENETICS, 3 Credits

Introductory concepts of bacterial molecular genetics. Topics include DNA replication, mutation, DNA repair, DNA recombination, transposons, bacteriophages, genetic manipulation, and gene regulation.

**Prerequisite:** MB 302 with D- or better and (BB 314 [D-] or BB 314H [D-]) and (BB 450 [D-] or BB 490 [D-]) and (BB 451 (may be taken concurrently) [D-] or BB 491 (may be taken concurrently) [D-])

**Equivalent to:** MB 306

## MB 311, ^MOLECULAR MICROBIOLOGY LAB: A WRITING INTENSIVE COURSE, 3 Credits

Scientific writing, laboratory notebook composition, experimental design, and laboratory experiments in bacterial molecular biology. (Writing Intensive Course)

**Attributes:** CWIC – Core, Skills, WIC

**Prerequisite:** (MB 303 with D- or better or MB 303H with D- or better) and MB 310 (may be taken concurrently) [D-]

**Equivalent to:** MB 307

## MB 312, BACTERIAL PHYSIOLOGY AND METABOLISM, 3 Credits

Molecular structure and function, macromolecular assembly, energy production and use, and cellular growth.

**Prerequisite:** MB 310 with D- or better and BB 451 [D-]

**Equivalent to:** MB 304

**Recommended:** BB 450

## MB 314, AQUATIC MICROBIOLOGY, 3 Credits

A survey of the diversity, ecology, and physiology of microbes in aquatic systems, with emphasis on their roles in food webs, chemical cycling, and human health. Provides the background knowledge and quantitative/analytical skills necessary to interpret and critique current and historical research in the fields of general aquatic microbiology.

**Prerequisite:** (CH 231 with D- or better or CH 231H with D- or better or CH 121 with D- or better) and (CH 232 [D-] or CH 232H [D-] or CH 122 [D-]) and (CH 233 [D-] or CH 233H [D-] or CH 123 [D-])

## MB 320, HUMAN BACTERIOLOGY, 4 Credits

Properties of bacteria, their biology, pathogenesis and concern to society. Emphasis on the role of bacteria in human health and disease. **CROSSLISTED** as BHS 320/MB 320.

**Prerequisite:** (BI 204 with C- or better and BI 205 [C-] and BI 206 [C-]) or ((BI 211 [C-] or BI 211H [C-]) and (BI 212 [C-] or BI 212H [C-]) and (BI 213 [C-] or BI 213H [C-])) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]) and (BI 223 [C-] or BI 223H [C-]))

**Equivalent to:** BHS 320

*Available via Ecampus*

## MB 330, \*DISEASE AND SOCIETY, 3 Credits

Infectious disease has many effects on the development of society, and likewise, human interactions affect the development of disease. The course examines these interactions with a focus on the role of race, class, and economic status in the development of epidemics. (Bacc Core Course)

**Attributes:** CPDP – Core, Perspective, Difference/Power/Discrimination

*Available via Ecampus*

## MB 340, HUMAN VIROLOGY, 4 Credits

Properties of viruses, their biology, pathogenesis and concern to society. Emphasis on viruses causing human disease. **CROSSLISTED** as BHS 340/MB 340.

**Prerequisite:** (BI 204 with C- or better and BI 205 [C-] and BI 206 [C-]) or ((BI 211 [C-] or BI 211H [C-]) and (BI 212 [C-] or BI 212H [C-]) and (BI 213 [C-] or BI 213H [C-])) or ((BI 221 [C-] or BI 221H [C-]) and (BI 222 [C-] or BI 222H [C-]) and (BI 223 [C-] or BI 223H [C-]))

**Equivalent to:** BHS 340

*Available via Ecampus*

## MB 385, ^EMERGING INFECTIOUS DISEASES AND EPIDEMICS, 3 Credits

Emerging and reemerging infectious disease is a contemporary global issue of great concern. To understand and evaluate the issue, the course covers germ theory, disease history and ecology, microbial pathogenesis and the immune response, historic plagues, and the biological, environmental, population and social changes that contribute to disease emergence. (Writing Intensive Course)

**Attributes:** CWIC – Core, Skills, WIC

**Prerequisite:** ((BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-]) and (BI 213 [D-] or BI 213H [D-])) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-]))

**Equivalent to:** BI 385



**MB 399, SPECIAL TOPICS, 1-16 Credits**

Equivalent to: MB 399H

*This course is repeatable for 16 credits.***MB 399H, SPECIAL TOPICS, 1-16 Credits****Attributes:** HNRS – Honors Course Designator

Equivalent to: MB 399

*This course is repeatable for 16 credits.***MB 401, RESEARCH, 1-16 Credits***This course is repeatable for 16 credits.***MB 403, THESIS, 1-16 Credits***This course is repeatable for 16 credits.***MB 405, READING AND CONFERENCE, 1-16 Credits**

Conference: Instruction in microbiology.

*This course is repeatable for 16 credits.***MB 406, SPECIAL PROJECTS, 1-16 Credits**

Reading and Conference/Instructor in Microbiology.

*This course is repeatable for 16 credits.***MB 407, SEMINAR, 1-16 Credits**

Graded P/N.

*This course is repeatable for 16 credits.***MB 410, OCCUPATIONAL INTERNSHIP, 1-10 Credits**

Supervised work experience at selected cooperating institutions, agencies, laboratories, clinics or companies. Maximum of 10 credits allowed but no more than 3 credits may be used to satisfy microbiology major requirement of 36 credits. Graded P/N.

*This course is repeatable for 10 credits.***MB 416, IMMUNOLOGY, 3 Credits**

Basic theory and applications of immunochemistry, immunogenetics, and cellular immunology. Examination of immunologically related diseases.

**Prerequisite:** BB 450 with D- or better or BB 490 with D- or better**MB 417, IMMUNOLOGY LABORATORY, 2 Credits**

Laboratory on the applications of current immunological techniques.

**Prerequisite:** (MB 303 with D- or better or MB 303H with D- or better) and MB 416 (may be taken concurrently) [D-]**MB 420, MICROBIAL GENOMES, BIOGEOCHEMISTRY, AND DIVERSITY, 3 Credits**

A survey of microbial diversity from the earliest lifeforms to the modern role of bacteria and archaea in global biogeochemical cycles.

Topics covered include molecular evolution, microbial genomics, biochemical diversity, and metabolic pathways that adapt cells to extreme environments. Particular emphasis is placed on marine systems, from photosynthesis in surface waters to life in the ocean crust.

**Prerequisite:** BB 451 with D- or better**MB 422, AQUATIC MICROBIOLOGY LABORATORY, 2 Credits**

Examine patterns of microbiological communities and how those patterns relate to environmental factors. Collect and process samples, analyze the resultant data and present those results. Focus on the microbial ecology of freshwater and marine systems as a foundation for discovery and learning using current analytical techniques.

**Prerequisite:** MB 303 with D- or better**Corequisites:** MB 314**MB 430, BACTERIAL PATHOGENESIS, 3 Credits**

Bacteria pathogenic for humans, emphasizing the structural, physiological and genetic mechanisms of pathogenesis. Role of the immune system in pathogenesis and protection.

**Prerequisite:** MB 302 with D- or better and MB 310 [D-] and (BB 451 [D-] or BB 491 [D-])**MB 434, VIROLOGY, 3 Credits**

Properties of viruses, their biology and pathogenesis. Emphasis on viruses causing human disease.

**Prerequisite:** ((BB 450 with D- or better or BB 450H with D- or better) and (BB 451 [D-] or BB 451H [D-])) or (BB 490 [D-] and BB 491 [D-] and BB 492 [D-])**MB 435, PATHOGENIC MICROBES LABORATORY, 2 Credits**

Laboratory experiments to illustrate concepts presented in MB 430 and/or MB 434, focusing on pathogenic microorganisms.

**Prerequisite:** (MB 303 with D- or better or MB 303H with D- or better) and MB 302 [D-] and (MB 430 (may be taken concurrently) [D-] or MB 434 (may be taken concurrently) [D-])**MB 436, THE HUMAN MICROBIOME, 3 Credits**

Examines the biodiversity, function, and medical importance of the communities of microorganisms that inhabit the human body. A diverse array of topics will be discussed, including how the human microbiome is studied, case studies of specific aspects of the human microbiome, and emerging theories of how the microbiome influences human health.

**Prerequisite:** BI 314 with D- or better or BB 314 with D- or better or BI 314H with D- or better or MB 302 with D- or better**MB 440, FOOD MICROBIOLOGY, 3 Credits**

Role of microorganisms in food spoilage, infection, and intoxication; also basic principles in contamination control and germicidal treatment during processing, preparing, and distributing food for consumption.

**Prerequisite:** MB 302 with D- or better**MB 441, FOOD MICROBIOLOGY LABORATORY, 2 Credits**

Laboratory techniques to accompany MB 440/MB 540.

**Prerequisite:** (MB 303 with D- or better or MB 303H with D- or better) and MB 440 (may be taken concurrently) [D-]**Recommended:** MB 302

## MB 448, MICROBIAL ECOLOGY, 3 Credits

A comparison of soil sediments and freshwater as microbial habitats. Discussion of the role of microorganisms in nutrient cycles, effects of microbial activity on plant and animal life.

**Prerequisite:** MB 302 with D- or better

## MB 456, MICROBIAL GENETICS AND BIOTECHNOLOGY, 3 Credits

General biology of natural, genetically engineered, and composite plasmids. Major topics include extrachromosomal DNA replication, plasmid transmission, insertion elements, transposons, gene expression, and recombinant DNA vectors. Biotechnological applications and molecular genetic tools are emphasized.

**Prerequisite:** MB 302 with D- or better and (BB 450 [D-] or BB 490 [D-]) and (BB 451 [D-] or BB 491 [D-]) and (MB 310 [D-] or BB 492 [D-])

## MB 479, FERMENTATION MICROBIOLOGY, 3 Credits

An introduction to industrial microbiology with a focus on the physiology of fermentation and use of microorganisms for the production of food ingredients, fermented foods, and beverages. FST students need to take BB 350 and MB students need to take BB 450 for their respective majors. CROSSLISTED as FST 479/MB 479 and FST 579/MB 579.

**Prerequisite:** ((BI 212 with C- or better or BI 212H with C- or better) or ((BI 221 with C- or better or BI 221H with C- or better) and (BI 223 [C-] or BI 223H [C-])) ) and CH 331 [C-] and CH 332 [C-] and (BB 350 [D-] or BB 450 [D-]) and MB 302 [D-]

**Equivalent to:** FST 479

## MB 480, GENERAL PARASITOLOGY, 3 Credits

Covers a broad overview of parasitology with emphasis on medical parasitology. Explores important groups and host/parasite relationships among all taxa from invertebrates to vertebrates, including mammals.

**Prerequisite:** ((BI 211 with D- or better or BI 211H with D- or better) and (BI 212 [D-] or BI 212H [D-]) and (BI 213 [D-] or BI 213H [D-])) or ((BI 221 [D-] or BI 221H [D-]) and (BI 222 [D-] or BI 222H [D-]) and (BI 223 [D-] or BI 223H [D-])) or (BI 204 [D-] and BI 205 [D-] and BI 206 [D-])

*Available via Ecampus*

## MB 490, MICROBIOLOGY CAPSTONE EXPERIENCE, 2 Credits

Capstone experience for microbiology students to practice professional skills necessary to sustain a career in science. Students will work in teams to analyze research data and communicate this analysis, in addition to explore career opportunities and learn how to successfully compete for jobs. Graded P/N.

**Prerequisite:** MB 302 with D- or better

## MB 491, FISH DISEASES IN CONSERVATION BIOLOGY AND AQUACULTURE, 3 Credits

Introduction to diseases of fish including pathogens important to aquaculture and ornamental industries as well as to wild fish populations and conservation programs. CROSSLISTED as FW 491/MB 491 and FW 591/MB 591.

**Equivalent to:** FW 491

**Recommended:** 9 credits of upper-division fisheries or biology.

## MB 496, FISH DISEASES IN CONSERVATION BIOLOGY AND AQUACULTURE LAB, 2 Credits

This laboratory complements lectures in FW/MB 491/591, with students learning basic necropsy techniques; identification of bacterial, viral and metazoan pathogens; and molecular identification methods.

CROSSLISTED as FW 496/MB 496 and FW 596/MB 596.

**Equivalent to:** FW 496

**Recommended:** MB 303 or other upper-division laboratory course.

## MB 499, SPECIAL TOPICS, 0-16 Credits

*This course is repeatable for 16 credits.*

**Recommended:** One term of biology

## MB 501, RESEARCH, 1-16 Credits

*This course is repeatable for 16 credits.*

## MB 503, THESIS, 1-16 Credits

*This course is repeatable for 999 credits.*

## MB 505, READING AND CONFERENCE, 1-16 Credits

*This course is repeatable for 16 credits.*

## MB 506, SPECIAL PROJECTS, 1-6 Credits

*This course is repeatable for 6 credits.*

## MB 507, SEMINAR, 1 Credit

Graded P/N.

*This course is repeatable for 99 credits.*

## MB 510, INTERNSHIP, 1-16 Credits

*This course is repeatable for 16 credits.*

## MB 511, SCIENTIFIC SKILLS, 1 Credit

Foundational skills for success in graduate school. Students will also become familiar with ongoing research programs in three active programs in the Microbiology Program.

## MB 512, HIGHLIGHTS OF MICROBIOLOGY, 1 Credit

Designed for students to gain familiarity with the history of microbiology through reading, reviewing and writing about great papers in the field. Students also meet the Microbiology Program faculty and students, and learn about some of the research in the Microbiology Program through attending colloquium.

## MB 513, MICROBIAL SYSTEMS, 3 Credits

Presentation of a modern view of microbiology through the lens of microbes' influences on our planet's habitats and inhabitants. Discusses current research and the use of advanced techniques to illustrate how microbiology is contributing to many cross-disciplinary problems that can involve engineering, public health, sociology, ecology, geology, etc.

## MB 516, IMMUNOLOGY, 3 Credits

Basic theory and applications of immunochemistry, immunogenetics, and cellular immunology. Examination of immunologically related diseases.

**Recommended:** BB 450 or BB 490

## MB 517, IMMUNOLOGY LABORATORY, 2 Credits

Laboratory on the applications of current immunological techniques.

**Recommended:** (MB 303 or MB 303H) and completion or concurrent enrollment in MB 516

## MB 520, MICROBIAL GENOMES, BIOGEOCHEMISTRY, AND DIVERSITY, 3 Credits

A survey of microbial diversity from the earliest lifeforms to the modern role of bacteria and archaea in global biogeochemical cycles.

Topics covered include molecular evolution, microbial genomics, biochemical diversity, and metabolic pathways that adapt cells to extreme environments. Particular emphasis is placed on marine systems, from photosynthesis in surface waters to life in the ocean crust.

**Recommended:** BB 451 or BB 551

## MB 522, AQUATIC MICROBIOLOGY LAB, 2 Credits

Examine patterns of microbiological communities and how those patterns relate to environmental factors. Collect and process samples, analyze the resultant data and present those results. Focus on the microbial ecology of freshwater and marine systems as a foundation for discovery and learning using current analytical techniques.

## MB 530, BACTERIAL PATHOGENESIS, 3 Credits

Bacteria pathogenic for humans, emphasizing the structural, physiological and genetic mechanisms of pathogenesis. Role of the immune system in pathogenesis and protection.

**Recommended:** MB 302 and MB 310 and (BB 451 or BB 491)

## MB 534, VIROLOGY, 3 Credits

Properties of viruses, their biology and pathogenesis. Emphasis on viruses causing human disease.

**Recommended:** ((BB 450 or BB 450H) and (BB 451 or BB 451H)) or (BB 490 and BB 491 and BB 492)

## MB 540, FOOD MICROBIOLOGY, 3 Credits

Role of microorganisms in food spoilage, infection, and intoxication; also basic principles in contamination control and germicidal treatment during processing, preparing, and distributing food for consumption.

**Recommended:** MB 302

## MB 541, FOOD MICROBIOLOGY LABORATORY, 2 Credits

Laboratory techniques to accompany MB 440/MB 540.

**Prerequisite:** MB 540 (may be taken concurrently) with C or better

**Recommended:** MB 302 and MB 303

## MB 548, MICROBIAL ECOLOGY, 3 Credits

A comparison of soil sediments and freshwater as microbial habitats. Discussion of the role of microorganisms in nutrient cycles, effects of microbial activity on plant and animal life.

**Recommended:** MB 302

## MB 555, BIOLOGY OF THE PROKARYOTES, 3 Credits

An integrative graduate course examining bacterial and archaeal life at different levels of biological organization, emphasizing current research and analysis of primary literature. The various life styles of prokaryotes are the common theme of the course. Topics include biofilms, cooperation and communication, development, stress responses, metabolic interactions involved in global nutrient cycling. Offered every even year in winter term.

**Recommended:** BB 450 and MB 310 and MB 312

## MB 556, MICROBIAL GENETICS AND BIOTECHNOLOGY, 3 Credits

General biology of natural, genetically engineered, and composite plasmids. Major topics include extrachromosomal DNA replication, plasmid transmission, insertion elements, transposons, gene expression, and recombinant DNA vectors. Biotechnological applications and molecular genetic tools are emphasized.

**Recommended:** MB 302 and (BB 450 or BB 490) and (BB 451 or BB 491) and (MB 310 or BB 492)

## MB 579, FERMENTATION MICROBIOLOGY, 3 Credits

An introduction to industrial microbiology with a focus on the physiology of fermentation and use of microorganisms for the production of food ingredients, fermented foods, and beverages. FST students need to take BB 350 and MB students need to take BB 450 for their respective majors.

**Equivalent to:** FST 579

**Recommended:** ((BI 212 or BI 212H) or ((BI 221 or BI 221H) and (BI 223 or BI 223H))) and CH 331, CH 332, (BB 350 or BB 450) and MB 302

## MB 580, GENERAL PARASITOLOGY, 3 Credits

Covers a broad overview of parasitology with emphasis on medical parasitology. Explores important groups and host/parasite relationships among all taxa from invertebrates to vertebrates, including mammals.

*Available via Ecampus*

## MB 591, FISH DISEASES IN CONSERVATION BIOLOGY AND AQUACULTURE, 3 Credits

Introduction to diseases of fish including pathogens important to aquaculture and ornamental industries as well as to wild fish populations and conservation programs. CROSSLISTED as FW 491/MB 491 and FW 591/MB 591.

**Equivalent to:** FW 591

**Recommended:** 9 credits of upper-division fisheries or biology.

## MB 596, FISH DISEASES IN CONSERVATION BIOLOGY AND AQUACULTURE LAB, 2 Credits

This laboratory complements lectures in FW/MB 491/591, with students learning basic necropsy techniques; identification of bacterial, viral and metazoan pathogens; and molecular identification methods. CROSSLISTED as FW 496/MB 496 and FW 596/MB 596.

**Equivalent to:** FW 596

**Recommended:** MB 303 or other upper-division laboratory course.

## **MB 599, SELECTED TOPICS, 0-6 Credits**

*This course is repeatable for 24 credits.*

## **MB 601, RESEARCH, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **MB 603, THESIS, 1-16 Credits**

*This course is repeatable for 999 credits.*

## **MB 605, READING AND CONFERENCE, 1-16 Credits**

*This course is repeatable for 16 credits.*

## **MB 607, SEMINAR, 1 Credit**

Graded P/N.

*This course is repeatable for 99 credits.*

## **MB 610, INTERNSHIP, 1-9 Credits**

*This course is repeatable for 16 credits.*

## **MB 668, MICROBIAL BIOINFORMATICS AND GENOME EVOLUTION, 4 Credits**

Theoretical and practical issues in microbial genome sequencing and annotation, with an emphasis on evolutionary theory and comparative analysis of microbial genome sequences. Metabolic prediction from genomes, with a population genetics perspective on comparative microbial genomics. Exploration of applications of genomics and allied tools to microbial populations, including metagenomics, metaproteomics, and metatranscriptomics.

**Equivalent to:** MCB 668

## **MB 699, SPECIAL TOPICS, 0-16 Credits**

Lec/lab.

*This course is repeatable for 16 credits.*