

MBIO-MICROBIOLOGY

MBIO 2124 Cornerstone Research Experience 4 Credit Hours

Prerequisite: permission of instructor. Hands-on course targeted toward freshmen and sophomores; therefore there are no prerequisite courses required. The goal is to provide students with an authentic laboratory research experience building and experimentally testing hypotheses, collection and processing of data, and oral and written presentation of research results. The skills learned in this course will be beneficial during and beyond an undergraduate career. (F, Sp) [II-NS].

MBIO 2815 Introduction to Microbiology 5 Credit Hours

Prerequisite: one course in college chemistry. Introduction to microorganisms as biological entities. Survey of the roles of microorganisms in the ecosystem. Application of microorganisms to industrial and environmental problems. Discussion of microorganisms as causes of human disease and response of hosts to microbial invasion. This course does not count for major credit in Microbiology or Botany. Laboratory (F, Sp, Su) [II-LAB].

MBIO 2970 Special Topics/Seminar 1-3 Credit Hours

1 to 3 hours. Prerequisite: Permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)

MBIO 3001 Microbiology: the Discipline and Degree 1 Credit Hour

Prerequisite: Biology 1114, Biology 1124 or Biology 1134. Introduce students to their discipline, degree and faculty. Allows students microbiology credit prior to MBIO 3813, which has a prerequisite of Chemistry 3053. By the end of the course students will have an introduction to use of the literature of microbiology and writing in scientific English, as well as familiarity with the discipline, progress towards degree completion and their faculty. (Sp)

MBIO 3113 Cell Biology 3 Credit Hours

(Crosslisted with BOT and BIOL 3113) Prerequisite: Botany 1114, or Biology 1134, or Biology 1114 and 1121, or Biology 1124; and Chemistry 3053. Introduction to the cell as a unit of life. A chemical and physical comparison of prokaryotic and eukaryotic cells to include a discussion of cell metabolism, types of metabolic regulation and an analysis of ultrastructure. Emphasis will be placed on the dynamic changes in metabolism and ultrastructure which occur during the life of a cell. (F, Sp)

MBIO 3283 Introduction to Genomics 3 Credit Hours

(Crosslisted with P BIO 3283) Prerequisite: P BIO 1114, or BIOL 1114, or BIOL 1134, or one course in Organic Chemistry (CHEM 3053 or CHEM 3153 or CHEM 3064 or CHEM 3164). Provides the most updated knowledge on prokaryotic and eukaryotic genomics including the biochemical, molecular and cellular structure of the genome as well as the current molecular and bioinformatics technologies existing when analyzing complex genomes and gene function. Through lectures and presentation of scientific literature, specific examples will be presented to highlight each aspect of the course. (F)

MBIO 3440 Mentored Research Experience 3 Credit Hours

0 to 3 hours. Prerequisites: ENGL 1113 or equivalent, and permission of instructor. May be repeated; maximum credit 12 hours. For the inquisitive student to apply the scholarly processes of the discipline to a research or creative project under the mentorship of a faculty member. Student and instructor should complete an Undergraduate Research & Creative Projects (URCP) Mentoring Agreement and file it with the URCP office. Not for honors credit. (F, Sp, Su)

MBIO 3673 Practical Bioinformatics 3 Credit Hours

(Crosslisted with P BIO 3673) Prerequisite: MBIO 2815, or MBIO 3813, or P BIO 1114, or BIOL 1005, or BIOL 1114, or equivalent introductory biology course, and junior standing, or instructor permission. Study of the use of computers to analyze and interpret various types of biological data. Topics covered will include accessing genomics databases, aligning DNA and protein sequences, searching genomic databases for similar sequences, analyzing protein structure, and building molecular phylogenies. Classes will emphasize group work and in-class computer exercises in a highly interactive environment. (Sp)

MBIO 3812 Fundamentals of Microbiology Laboratory 2 Credit Hours

Prerequisite: credit or concurrent enrollment in 3813. Fundamental microbiological methods: aseptic technique, culture methods, microscopy, metabolic and physiological tests, bacterial isolation and identification, environmental microbiology. Laboratory (F, Sp, Su)

MBIO 3813 Fundamentals of Microbiology 3 Credit Hours

Prerequisite: BIOL 1005 or BIOL 1134 or P BIO 1114 or BIOL 1114, and CHEM 3013 or CHEM 3053 or CHEM 3064. Cell structure and phylogeny of bacteria, archaea, and eukaryotic microorganisms; growth, metabolism and ecological roles; symbiotic relationships; gene expression, genetic exchange, genomics. (F, Sp, Su)

MBIO 3932 Instrumental Methods in Biology 2 Credit Hours

(Crosslisted with P BIO 3932) Prerequisite: one of the following: Plant Biology 4115 or MBIO 2815 or MBIO 3813 or Biology 2124 or one course in biochemistry; and Physics 2414. Principles of analytical measurements; common categories of instruments; advantages and disadvantages of each method; examples are chosen from medical technology, environmental technology, biochemistry, physiology, etc. (F)

MBIO 3960 Honors Reading 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Consists of topics designated by the instructor in keeping with the student's major program. The topics will cover materials not usually presented in the regular courses. (F, Sp, Su)

MBIO 3970 Honors Seminar 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. Projects covered will vary. Deals with concepts not usually presented in regular coursework. (By request)

MBIO 3980 Honors Research 1-3 Credit Hours

1 to 3 hours. Prerequisite: admission to Honors Program. May be repeated; maximum credit six hours. (F, Sp, Su)

MBIO 3990 Independent Study 1-3 Credit Hours

1 to 3 hours. Prerequisite: one course in general area to be studied; permission of instructor and department. May be repeated; maximum credit six hours. Contracted independent study for topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)

MBIO 4263 Cell Biology Laboratory 3 Credit Hours

(Crosslisted with P BIO 4263) Prerequisite: MBIO 3812 and 3813, or two courses in Plant Biology, and completion of or concurrent enrollment in MBIO/Plant Biology/Biology 3113. Gives students experience with modern techniques used in the study of cells. The techniques covered will allow exploration of cell biology at the level of tissues, single cells, subcellular components, and molecules. (F)

- MBIO 4313 Biotechnology Applications 3 Credit Hours**
(Crosslisted with P BIO 4313) Prerequisite: P BIO/BIOL 3113, or P BIO/BIOL 3333, or P BIO/BIOL/MBIO 4843, or P BIO/MBIO 4873, or CHEM 3653, or permission of instructor. Intended for students who possess a working knowledge of molecular biology, this course will focus on developing familiarity with methods used in biotechnology to address pressing societal challenges. Students will put into practice central methods of biotechnology, gaining practical skills for use in future careers in laboratory science, particularly methods relevant to pharmaceutical production, agricultural improvement, bio-fuel production, and medical and forensic diagnostics, among others. (Sp)
- MBIO 4394 Advanced Light Microscopy 4 Credit Hours**
(Slashlisted with MBIO 5394; Crosslisted with BIOL and P BIO 4394) Prerequisite: permission of instructor and junior standing. Corequisite: Lab section. Focuses on theory and techniques in light microscopy, covering principles including confocal laser scanning microscopy, multiple photon imaging, FLIM/FCS, FRET, fluorescence microscopy, phase contrast, DIC, 3D rendering, and other advanced optical technologies. Also includes a lab section where students will learn to use advanced epifluorescence and confocal microscopes. No student may earn credit for both 4394 and 5394. (F)
- MBIO 4673 Microbiomes and Microbial Systematics 3 Credit Hours**
(Slashlisted with MBIO 5673) Prerequisite: MBIO 3812 and 3813, and CHEM 3013 or 3053, or permission of instructor. Introduces students to the modern day characterization of microbiomes, from initial sequence information to the living organisms that make up these complex communities. No student may earn credit for both 4673 and 5673. (Sp)
- MBIO 4703 Basic Virology 3 Credit Hours**
Prerequisite: MBIO 3813, and either CHEM 3653 or MBIO/P BIO/BIOL 4843, or permission of instructor. Introduction to the principles of viruses that infect animals, plants and bacteria. Topics will include viral structural and taxonomy, virus replication and disease pathogenesis, methods of viral detection and diagnosis, host resistance to viral infections, viruses and cancer and the use of viruses in gene therapy and vaccine applications. (Sp)
- MBIO 4723 Biocatalysis and Bioremediation 3 Credit Hours**
(Slashlisted with MBIO 5723) Prerequisites: MBIO 3813 and one semester of Organic Chemistry (CHEM 3053) or Biochemistry (CHEM 3653), or permission of instructor. Introduces the role of microorganisms in the biocatalysis and bioremediation of relevant pollutants. Focuses on bioremediation strategies, the physiology of aerobes vs. anaerobes, biocatalysis and genetics of biodegradation pathways, and methods for monitoring in situ biodegradation. No student may earn credit for both 4723 and 5723. (Sp)
- MBIO 4733 Microbial Genetics 3 Credit Hours**
(Slashlisted with MBIO 5733) Prerequisite: MBIO/P BIO/BIOL 4843, or permission of instructor. Microbial genetics underlies important topics such as antibiotic resistance, genetic engineering, drug development, and many biotechnological advances. Explores the interesting world of microbial genetics by discussing molecular genetic methods and related aspects of bacterial and archaeal biology. Examples will include both traditional and recently developed microbial model systems. No student may earn credit for both 4733 and 5733. (Sp)
- MBIO 4743 Case Studies in Medical Microbiology 3 Credit Hours**
Prerequisite: MBIO 3813; MBIO 4823 or concurrent enrollment; or instructor permission. Provides in-depth knowledge of infectious diseases utilizing an inquiry-based format. Case studies will be discussed in the context of patient symptoms as well as molecular- and culture-based test results. Case studies from standard textbooks and clinical microbiology journals will be utilized. Students will gain experience in identifying causative agents of numerous infections. Ideal course for pre-dental, pre-medical and pre-pharmacy students. (Irreg.)
- MBIO 4810 Special Topics 3 Credit Hours**
1 to 3 hours. (Slashlisted with MBIO 5810) Prerequisite: two courses in Microbiology and permission of instructor. May be repeated with change of content; maximum credit three hours per semester, nine hours total. Topics will include newly developing areas of the discipline. Taught at an upper-division level based on previous course background. No student may earn credit for both 4810 and 5810. (Irreg.)
- MBIO G4813 Ecology and Pathogenic Microbiology Lab 3 Credit Hours**
Prerequisite: 3812 and 3813 or equivalent. Course incorporates laboratory approaches and techniques for the study, characterization and manipulation of individual microorganisms and microbial communities involved in pathogenesis and environmental processes. Contemporary molecular techniques including PCR, recombinant DNA, DNA/RNA analysis; immuno-biological analysis will encompass a large part of this laboratory course. Students will also become acquainted with approaches to discover the mechanisms micro-organisms use to establish their ecological niche in both pathogenic and environmental settings. Laboratory (Sp)
- MBIO G4823 Pathogenic Microbiology and Infectious Disease 3 Credit Hours**
Prerequisite: MBIO 3812 and MBIO 3813. Introduces the basic methods for pathogenic microbiology and infectious disease epidemiology. Topics covered include definitions and nomenclature, outbreak investigations, disease surveillance, case-studies, laboratory diagnosis, immunology, molecular epidemiology, dynamics of transmission, and vaccine effectiveness. Emerging pathogens, their effects on society and the health care services will also be addressed. (F)
- MBIO 4833 Basic Immunology 3 Credit Hours**
Prerequisite: one semester of organic chemistry, and an introductory biology course, plus one of the following: 3813 and 3812, Zoology 2124, 3113, 3204, 3333 or biochemistry or graduate standing and permission. Fundamentals of immunochemistry, cellular immunology, immunogenetics and clinical immunology. (Sp)
- MBIO 4843 Molecular Biology 3 Credit Hours**
(Crosslisted with P BIO and BIOL 4843; Slashlisted with MBIO 5843) Prerequisite: MBIO 3812 and MBIO 3813, or Plant Biology 1114, or Biology 1114, or Biology 1124, or Biology 1134, and one course in organic chemistry. Introduction to the characteristics and biological functions of nucleic acids and proteins in living cells with emphasis on nucleic acid replication, transcription, translation and regulation; also emphasis on the molecular aspects of microbial genetics transformation, transduction and conjugation; and emphasis on molecular immunology and genetic engineering/recombinant DNA technology. No student may earn credit for both 4843 and 5843. (F, Sp)
- MBIO G4853 Physiology of Microorganisms 3 Credit Hours**
Prerequisite: MBIO 3813, MBIO 3812 and a course in organic chemistry, or graduate standing. Diversity, metabolism, energetics and physiology of microorganisms. (Sp)

- MBIO 4864 Geomicrobiology 4 Credit Hours**
(Slashlisted with 5864) Prerequisite: 3813 or permission of instructor. Life below the earth's surface. Bacterial degradation of pollutants. Petroleum microbiology. Role of microorganisms in geochemical cycling of carbon, sulfur, and metals. No student may earn credit for both 4864 and 5864. (F) [II-NL] .
- MBIO 4873 Microbial Physiology and Molecular Biology Laboratory 3 Credit Hours**
(Crosslisted with P BIO 4873) Prerequisite: junior standing or permission of instructor. Current techniques to explore molecular aspects of gene expression and regulation. Experiments include: plasmid and phage propagation, nucleic acid purification, DNA and protein manipulation, and gene analysis. (F, Sp) [II-LAB] .
- MBIO G4883 Water Microbiology Laboratory 3 Credit Hours**
Prerequisite: MBIO 3812 and MBIO 3813. Focuses on the causes and prevention of waterborne microbial diseases and the use of microorganisms to improve water quality. Topics include: waterborne diseases, detection of waterborne pathogens, epidemiology, indicator organisms, water quality standards, treatment of drinking water and sewage, and groundwater contamination. The laboratory provides training in the standard methods used to detect microbial contamination. (F)
- MBIO 4893 Capstone in Microbiology 3 Credit Hours**
Prerequisite: three hours of calculus; 3813, 3812 and corequisite or prerequisite 4843. Combines laboratory research experiences, primarily in the areas of microbial diversity, physiology, and genetics, with an introduction to how research in microbiology is carried out. Laboratory (F, Sp) [V] .
- MBIO 4903 Topics in Virology 3 Credit Hours**
(Slashlisted with MBIO 5903) Prerequisite: Chemistry 3653 or MBIO 4843 or permission of instructor. Aspects related to selected RNA viruses, such as HIV/AIDS and polio virus, will be studied and discussed. Topics will include the molecular structure of RNA viruses, the mechanisms of viral assembly and replication, viral disease pathogenesis, host responses to viral infections, vaccine development, anti-viral and RNA interference (RNAi) therapeutics. No student may earn credit for both 4903 and 5903 on the same topic. (F)
- MBIO 4950 Senior Thesis - Capstone 1-6 Credit Hours**
1 to 6 hours. Prerequisite: 3813 and permission of instructor. May be repeated for credit; maximum credit six hours. A minimum total of six hours is required. This is a capstone course allowing students to carry out individual research projects under a faculty mentor. Students will present research results orally in a poster session, and by writing a senior thesis. Honors research credit may substitute for some or all of the senior thesis credit hours. (F, Sp, Su) [V] .
- MBIO 4953 BioWriting 3 Credit Hours**
(Slashlisted with MBIO 5953; Crosslisted with BIOL/PBIO 4953)
Prerequisite: permission of instructor. This course provides students engaged in research with the information and skills needed to effectively communicate as professional biologists. Students will learn to report the results of their own research in the format of a journal article, conference-style presentation, and poster. No student may earn credit for both 4953 and 5953. (Irreg.)
- MBIO 4960 Directed Readings 1-4 Credit Hours**
1 to 4 hours. Prerequisite: good standing in University; permission of instructor and dean. May be repeated; maximum credit four hours. Designed for upper-division students who need opportunity to study a specific problem in greater depth than formal course content permits. (Irreg.)
- MBIO 4970 Special Topics/Seminar 1-3 Credit Hours**
1 to 3 hours. Prerequisite: Senior standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- MBIO 4990 Independent Study 1-3 Credit Hours**
1 to 3 hours. Prerequisite: three courses in general area to be studied; permission of instructor and department. May be repeated; maximum credit six hours. Contracted independent study for topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (F, Sp, Su)
- MBIO 5364 Transmission Electron Microscopy 4 Credit Hours**
(Crosslisted with BOT and ZOO 5364) Prerequisite: permission. Introduction to the theory of transmission electron microscopy and practical instruction in specimen preparation, ultramicrotomy, instrument operation, photography and quantitative methods. Laboratory (F)
- MBIO 5374 Scanning Electron Microscopy 4 Credit Hours**
(Crosslisted with BOT and ZOO 5374) Prerequisite: basic chemistry; basic physics; demonstrated need; permission of instructor. Principles of scanning electron microscopy combined with training in the operation of the SEM and ancillary equipment. Students will be certified in the operation of all equipment. Sample preparation on a variety of samples and darkroom procedures will be performed. Independent project with oral report and poster required. Laboratory .
- MBIO 5394 Advanced Light Microscopy 4 Credit Hours**
(Crosslisted with BIOL 5394 and P BIO 5394; slashlisted with 4394)
Prerequisite: permission of instructor and graduate standing. Corequisite: Lab section. Focuses on theory and techniques in light microscopy covering principles including confocal laser scanning microscopy, multiple photon imaging, FLIM/FCS, FRET, fluorescence microscopy, phase contrast, DIC, 3D rendering, and other advanced optical technologies. Also includes a lab section where students will learn to use advanced epifluorescence and confocal microscopes. No student may earn credit for both 4394 and 5394. (F)
- MBIO 5453 Advanced Ecology and Evolutionary Biology 3 Credit Hours**
(Crosslisted with BOT and ZOO 5453) Prerequisite: general ecology. Required for students in the ecology and evolutionary biology doctoral program. An introduction to current research opportunities and research programs in ecology and evolutionary biology at the University of Oklahoma. Specific topics and lecturers will vary from week to week to give students a broad overview of ongoing research projects. (F)
- MBIO 5471 Seminar in Ecology and Evolutionary Biology 1 Credit Hour**
(Crosslisted with BOT and ZOO 5471) Prerequisite: graduate standing. Two semesters of enrollment are required for students in the ecology and evolutionary biology doctoral program. An intensive, student-based seminar in which students present both proposals and ongoing progress reports on doctoral level research projects in ecology and evolutionary biology. (F, Sp)
- MBIO 5620 Investigations in Microbiology 1-6 Credit Hours**
1 to 6 hours. Prerequisite: 15 hours of microbiology or permission of instructor. May be repeated with change of subject matter; nine hours for a Masters student and twelve hours for a Ph.D. student. Maximum of six hours allowed with one professor, unless approved by Department Chair by petition. Fields of study: environmental microbiology, immunology, industrial microbiology, medical microbiology, medical mycology, microbial ecology, microbial genetics, microbial physiology, ultra-structural morphology, virology and molecular biology. (F, Sp, Su)

- MBIO 5673 Microbiomes and Microbial Systematics 3 Credit Hours**
(Slashlisted with MBIO 4673) Prerequisite: graduate standing and MBIO 3812 and 3813, and CHEM 3013 or 3053, or permission of instructor. Introduces students to the modern day characterization of microbiomes, from initial sequence information to the living organisms that make up these complex communities. No student may earn credit for both 4673 and 5673. (Sp)
- MBIO 5723 Biocatalysis and Bioremediation 3 Credit Hours**
(Slashlisted with MBIO 4723) Prerequisite: graduate standing and MBIO 3813 and one semester of Organic Chemistry (CHEM 3053) or Biochemistry (CHEM 3653), or permission of instructor. Introduces the role of microorganisms in the biocatalysis and bioremediation of relevant pollutants. Focuses on bioremediation strategies, the physiology of aerobes vs. anaerobes, biocatalysis and genetics of biodegradation pathways, and methods for monitoring in situ biodegradation. No student may earn credit for both 4723 and 5723. (Sp)
- MBIO 5733 Microbial Genetics 3 Credit Hours**
(Slashlisted with MBIO 4733) Prerequisite: graduate standing and MBIO/PBIO/BIOL 4843 or 5843, or permission of instructor. Microbial genetics underlies important topics such as antibiotic resistance, genetic engineering, drug development, and many biotechnological advances. Explores the interesting world of microbial genetics by discussing molecular genetic methods and related aspects of bacterial and archaeal biology. Examples will include both traditional and recently developed microbial model systems. No student may earn credit for both 4733 and 5733. (Sp)
- MBIO 5810 Special Topics 3 Credit Hours**
1 to 3 hours. (Slashlisted with MBIO 4810) Prerequisite: two courses in microbiology, graduate standing and permission. May be repeated with change of content; maximum credit three hours per semester, nine hours total. Topics will include newly developing areas of the discipline. Taught at an upper-division level based on previous course background. No student may earn credit for both 4810 and 5810. (Irreg.)
- MBIO 5843 Molecular Biology 3 Credit Hours**
(Crosslisted with PBIO and Biology 5843; Slashlisted with MBIO 4843) Prerequisite: graduate standing or permission of instructor. Introduction to the characteristics and biological functions of nucleic acids and proteins in living cells with emphasis on nucleic acid replication, transcription, translation and regulation; also emphasis on the molecular aspects of microbial genetics transformation, transduction and conjugation; and emphasis on molecular immunology and genetic engineering/recombinant DNA technology. No student may earn credit for both 4843 and 5843. (F, Sp)
- MBIO 5864 Geomicrobiology 4 Credit Hours**
(Slashlisted with 4864) Prerequisite: 3813 or permission of instructor. Life below the earth's surface. Bacterial degradation of pollutants. Petroleum microbiology. Role of microorganisms in geochemical cycling of carbon, sulfur, and metals. No student may earn credit for both 4864 and 5864. (F)
- MBIO 5883 Advanced Molecular Biology 3 Credit Hours**
(Crosslisted with PBIO 5883) Prerequisite: graduate standing and MBIO/Plant Biology/Biology 4843 or 5843; or Chemistry 3653; or permission of instructor. The study of molecular biology in real-life research laboratories, focusing on the thought and practice behind molecular biology. Scientific literature will be used as a source of information to highlight the practical concerns for students working in molecular biology laboratories. (Sp)
- MBIO 5903 Topics in Virology 3 Credit Hours**
(Slashlisted with MBIO 4903) Prerequisite: graduate standing and CHEM 3653 or MBIO 4843 or permission of instructor. Aspects related to selected RNA viruses, such as HIV/AIDS and polio virus, will be studied and discussed. Topics will include the molecular structure of RNA viruses, the mechanisms of viral assembly and replication, viral disease pathogenesis, host responses to viral infections, vaccine development, anti-viral and RNA interference (RNAi) therapeutics. No student may earn credit for both 4903 and 5903 on the same topic. (F)
- MBIO 5953 BioWriting 3 Credit Hours**
(Slashlisted with MBIO 4953; Crosslisted with BIOL/PBIO 5953) Prerequisite: permission of instructor. This course provides students engaged in research with the information and skills needed to effectively communicate as professional biologists. Students will learn to report the results of their own research in the format of a journal article, conference-style presentation, and poster. Graduate students have additional assignments beyond those completed by undergraduates. No student may earn credit for both 4953 and 5953. (Irreg.)
- MBIO 5960 Directed Readings 1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing and permission of department. May be repeated; maximum credit twelve hours. Directed readings and/or literature reviews under the direction of a faculty member. (F, Sp, Su)
- MBIO 5970 Special Topics/Seminar 1-3 Credit Hours**
1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit nine hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or laboratory research and field projects. (Irreg.)
- MBIO 5971 Seminar in Microbiology 1 Credit Hour**
Prerequisite: graduate standing, permission of instructor. Required of all graduate students in microbiology. May be repeated; maximum credit two hours for the master's degree, three hours for the doctor's degree. Topics are selected from various areas of microbiology, and each student is called upon for discussion or formal presentations. No laboratory. (F, Sp)
- MBIO 5980 Research for Master's Thesis 2-9 Credit Hours**
Variable enrollment, two to nine hours; maximum credit applicable toward degree, six hours. (F, Sp, Su)
- MBIO 5990 Special Studies in Microbiology 1-3 Credit Hours**
1 to 3 hours. Prerequisite: 15 hours of microbiology, permission of instructor. May be repeated; Maximum credit of six hours with one professor, unless approved by Department Chair by petition. The student selects an area in which the student desires to read intensively, selects a staff member who is an authority in that field, and together they plan a program for investigation of the literature. (F, Sp, Su)
- MBIO 6003 Ecological Modeling 3 Credit Hours**
(Crosslisted with BOT and ZOO 6003) Prerequisite: one computer course, one course in ecology, or permission of instructor. Trains students to use modeling tools in their research and to gain greater ability to understand, appreciate, and criticize modeling work. Students will learn general procedure and principles with case studies of successful models in ecology and participate in course projects to gain hands-on experience in model development. (Irreg.)

MBIO 6813 Advanced Bacterial Metabolism 3 Credit Hours

Prerequisite: 3813 and 3812, plus six hours of microbiology, biochemistry, organic chemistry or permission. Recent advances in bacterial metabolism will be covered with emphasis on unusual bacterial pathways and on the biotransformations of environmentally significant materials. (Sp odd-numbered years)

MBIO 6873 Microbial Ecology 3 Credit Hours

Prerequisite: 3813 and 3812 plus two courses in microbiology, or 3813 and 3812 plus one microbiology course and one ecology course; biochemistry; calculus; or permission. Advanced treatment of the development and interactions of microbial communities with their living and abiotic environment. Emphasis placed on experimental approaches and on the quantitative concepts of the subject matter. Topics include a kinetic evaluation of microbial activities, global carbon cycling, biodegradation of environmentally significant materials and techniques used in the study of microbial ecology. (F even-numbered years)

MBIO 6960 Directed Readings 1-3 Credit Hours

1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit six hours. Directed readings and/or literature review under the direction of a faculty member. (Irreg.)

MBIO 6970 Special Topics/Seminar 1-3 Credit Hours

1 to 3 hours. Prerequisite: graduate standing or permission of instructor. May be repeated; maximum credit 12 hours. Special topics or seminar course for content not currently offered in regularly scheduled courses. May include library and/or research and field projects. (Irreg.)

MBIO 6980 Research for Doctoral Dissertation 2-16 Credit Hours

2 to 16 Hours. (F, Sp, Su)

MBIO 6990 Independent Study 1-3 Credit Hours

1 to 3 hours. Prerequisite: Graduate standing and permission of instructor. May be repeated; maximum credit nine hours. Contracted independent study for a topic not currently offered in regularly scheduled courses. Independent study may include library and/or laboratory research and field projects. (Irreg.)