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Microbiology

Microbiology is the study of microorganisms, a large and diverse group of organisms that exist as single cells or cell clusters. The science of microbiology includes the study of microbial growth, biochemistry, genetics and ecology and the relationship of microorganisms to other organisms including humans. As a basic biological science, microbiology provides some of the most accessible research tools for probing the nature of life processes. Our sophisticated understanding of the chemical and physical principles governing life has developed from studies of microorganisms. As an applied biological science, microbiology deals with many important practical problems in medicine, agriculture, biodegradation and food industries, and is at the heart of biotechnology industries. Students pursuing a major in microbiology will have an opportunity to take coursework related to these important areas. Chemistry is also an integral part of modern microbiology. Therefore, general and organic chemistry are required for the microbiology major. A minor in chemistry can be achieved by completing both the chemistry requirements and MICR 425 with grade of C or better. In addition, opportunities for undergraduate research in microbial biochemistry, genetics and diversity, as well as in immunology and molecular biology are available for outstanding undergraduate students. The microbiology major, chemistry minor and undergraduate research options are strong assets for students who seek careers in health care professions or industrial microbiology, or who seek graduate training in microbiology or related disciplines.

The following program of study prepares students for research or teaching positions after the bachelor's degree or for advanced study in graduate programs in microbiology, molecular biology or cell biology. A grade of C or better must be earned in MICR 301 and MICR 302 to fulfill degree requirements. Transfer courses used for MICR 301 and MICR 302 equivalencies must have a C grade or better. An overall grade point average of 2.00 or better for all microbiology courses is required to satisfy degree requirements. A student cannot repeat a course or its equivalent in which a grade of B or better was earned without the consent of the program.

Bachelor of Science (B.S.) in Microbiology Degree Requirements

Degree Requirements	Credit Hours
University Core Curriculum Requirements	39
Microbiology Major Requirements	63
BIOL 211, BIOL 212,(3 hours included in the UCC Life Science hours)	5
MICR 301, MICR 302, MICR 403, MICR 460, MICR 480, MICR 481 and MICR 495.	22
Microbiology Electives - Senior level work consisting of lecture courses selected from: MICR 406, MICR 421, MICR 423, MICR 425, MICR 441, MICR 453, MICR 454, MICR 470, MICR 477	12

Degree Requirements	Credit Hours
CHEM 200 or CHEM 200H, CHEM 201, CHEM 202 or CHEM 202H, CHEM 210 or CHEM 210H, CHEM 211, CHEM 212 or CHEM 212H, CHEM 340, CHEM 341 and CHEM 442.	15
MATH 141, MATH 150 or MATH 151 (3 hours included in the UCC Mathematic Hours)	1
PHYS 203A, PHYS 253A, PHYS 203B, PHYS 253B	8
Electives	12
Additional School of Biological Sciences Academic Requirements	6
Supportive Skills - CS 200B or CS 201 or CS 202; ENGL 290, ENGL 291, ENGL 491; MATH 282 or PLB 360 or ZOO 360; or any two-semester sequence of one of the following foreign languages: 200-level French, German, Japanese, or Spanish	6
Total	120

Microbiology Minor

A minor in Microbiology consists of 16 credit hours, to include MICR 301, MICR 302, and other courses determined by the student in consultation with the Microbiology advisor.

Technology Fee

The College of Agricultural, Life, and Physical Sciences assesses undergraduate majors a technology fee of \$4.58 per credit hour up to 12 credit hours. The fee is charged Fall and Spring semester.

Microbiology Courses

MICR101 - Microbes and Society A discussion of the personal and social implications of the interactions between humans and microorganisms. Topics include: microbial structure, genetics and metabolism; the general role of microorganisms in industry, the environment, agriculture, food production, and disease; the use of microorganisms in biotechnology and biodegradation, and in the manufacture of useful products; methods of transmission and control of infectious agents. Three hours lecture. Credit Hours: 3

MICR201 - Elementary Microbiology (University Core Curriculum course) Basic concepts of microbiology, classification, metabolic activity and the effect of physical and chemical agents on microbial populations. Host-parasite interactions. Infectious agents, methods of transmission and control. Three hours lecture and three hours laboratory per week. Spring semester. Satisfies the University Core Curriculum Science Group II requirement in lieu of PLB 115 or ZOO 115. Lab fee: \$30. Credit Hours: 4

MICR301 - Principles of Microbiology Structure, metabolism, growth, genetics, molecular biology, and applied aspects of microorganisms with emphasis on pure culture methods of study of bacteria and

viruses. Three hours lecture, three hours laboratory. Fall semester. Prerequisite: CHEM 200, 201, 210 and 211, and BIOL 200A or BIOL 211 or ZOOL 118. Lab fee: \$30. Credit Hours: 4

MICR302 - Molecular Biology Molecular structure, dynamics, and genetics of living cells and viruses with particular attention to the transfer of biological information. Spring semester. Prerequisite: CHEM 200, 201, 210 and 211, and BIOL 200A or BIOL 211. Credit Hours: 3

MICR403 - Medical Microbiology Lecture (Same as MBMB 403) A survey of the more common bacterial, mycotic and viral infections of humans with particular emphasis on the distinctive properties, pathogenic mechanisms, epidemiology, immunology, diagnosis and control of disease-causing microorganisms. Three hours lecture. Spring semester. Prerequisite: MICR 301, or consent of instructor. Credit Hours: 3

MICR405 - Clinical Microbiology (Same as MBMB 405) This course will be offered in Springfield only. A comprehensive course for health science professionals covering the biology, virulence mechanisms, and identification of infectious agents important in human disease and host-defense mechanisms. Clinical applications emphasized. Three hours lecture. Prerequisite: MICR 301, or consent of instructor. Credit Hours: 3

MICR406 - Introduction to Mycology (Same as MBMB 406) This course will provide an overview of fungal diversity and taxonomy, fungal cell and molecular biology. Additionally, it will cover the ecological, economic, and historical impact of fungi on the environment, science, and society. Prerequisite: MICR 301 with a grade of C or better or consent of instructor. Credit Hours: 3

MICR421 - Biotechnology (Same as MBMB 421) Topics covered will include the genetic basis of the revolution in biotechnology, medical applications including genetic screening and therapeutic agents, industrial biotechnology and fermentation, and agricultural applications. Three hours lecture. Fall semester. Prerequisite: MICR 302, or consent of instructor. Credit Hours: 3

MICR423 - Geomicrobiology (Same as MBMB 423 and GEOL 423) The course will focus on the role that microorganisms play in fundamental geological processes. Topics will include an outline of the present understanding of microbial involvement of weathering of rocks, formation and transformation of soils and sediments, and genesis and degradation of minerals. Elemental cycles will also be covered with emphasis on the interrelationships between the various geochemical cycles and the microbial trophic groups involved. Prerequisite: MICR 301 and CHEM 210 and 211. Recommended: GEOL 220, 221 or 222. Credit Hours: 3

MICR425 - Biochemistry and Physiology of Microorganisms Lecture (Same as MBMB 425) Chemical composition, cellular structure, and metabolism of microorganisms. Fall semester. Prerequisite: CHEM 340 or CHEM 339. Credit Hours: 3

MICR441 - Viruses and Disease (Same as MBMB 441) An intensive, lecture-based course in virology which will emphasize principles of molecular virology, the ubiquity of viruses in nature, evolutionary relationships between viruses, co-evolution between virus and host, and the pathogenic consequences of some viral infections (e.g., AIDS, hepatitis, cancer, etc.). Prerequisites: MICR 460 or MBMB 460 or consent of instructor. Credit Hours: 3

MICR453 - Immunology Lecture (Same as MBMB 453) Principles of molecular and cellular immunology. Particular emphasis is given to molecular mechanisms involved in activation and maintenance of the immune response at the basic science level. The role of the immune system in medical diagnostic procedures and in human health is also discussed. Spring semester. Prerequisite: MICR 403, or consent of instructor. Credit Hours: 3

MICR454 - Soil Microbiology (Same as CSEM 454, PSAS 454) A study of microbial numbers, characteristics, and biochemical activities of soil microorganisms with emphasis on transformation of organic matter, minerals, and nitrogen in soil. Prerequisite: MICR 301 or CSEM 240. Lab fee: \$15. Credit Hours: 4

MICR455 - Medical Immunology (Same as MBMB 455) This course will be offered in Springfield only. A survey of the components of the immune system and how they interact with each other to

produce responses that are important in the control or mediation of human disease. Two hours lecture. Prerequisite: MICR 301 or consent of instructor. Credit Hours: 2

MICR460 - Bacterial and Viral Genetics (Same as MBMB 460) The genetic mechanisms and regulatory events that control gene transfer, lambda phage infection, recombination, and metabolic pathways including a brief introduction to bioinformatics, genome analysis and global regulatory functions. Three hours lecture. Fall semester. Prerequisite: MICR 301 and 302, or consent of instructor. Credit Hours: 3

MICR470 - Prokaryotic Diversity Lecture (Same as MBMB 470) A consideration of the major groups of prokaryotes with special emphasis on their comparative physiology and ecology. Three hours lecture. Spring semester. Prerequisite: MICR 301 or consent of instructor. Credit Hours: 3

MICR477 - Microbial Ecology (Same as MBMB 477) Concepts of ecology applied to microorganisms; methods in microbial ecology; interactions of microbes with their living and non-living environment; microbial habitats and functions. Roles and regulation of microbes in natural and man-made environments, from cellular to community level. Prerequisite: MICR 301 or instructor's consent (based on proven background in both microbiology and ecology). Credit Hours: 3

MICR480 - Molecular Biology of Microorganisms Laboratory (Same as MBMB 480) Genetic and biochemical analyses of microorganisms using a variety of techniques in molecular biology, molecular genetics and biotechnology. Six hours laboratory per week plus two hours of supervised unstructured laboratory work in most weeks. Fall semester. Prerequisite: MICR 301 and 302 with a C grade or better and two (or concurrent enrollment in two) of the following: MICR 421, 423, 425 or 460. Lab fee: \$60. Credit Hours: 4

MICR481 - Diagnostic and Applied Microbiology Laboratory (Same as MBMB 481) Enrichment and isolation of prokaryotes from natural samples, diagnostic methods for the identification of pathogenic bacteria, and the nature of the immune response. Six hours laboratory per week plus two hours supervised unstructured laboratory work in most weeks. Spring semester. Prerequisite: MICR 301 and 302 with a C grade or better and two (or concurrent enrollment in two) of the following: MICR 403, 453 or 470. Lab fee: \$60. Credit Hours: 4

MICR490 - Undergraduate Research Participation Investigation of a problem either individually or as part of a research group under the direction of a member of the faculty. Not for graduate credit. Prerequisite: MICR 301 or equivalent and a 3.0 or better grade point average in Microbiology. Special approval needed from the instructor. Credit Hours: 1-3

MICR495 - Microbiology Seminar Readings, discussions, and presentations of current research topics on microbiology. Restricted to junior and senior standing in Microbiology or Biological Sciences. Graded P/F only. Credit Hours: 1

Microbiology Faculty

Bender, Kelly S., Associate Professor, Ph.D., Southern Illinois University Carbondale, 2003.

Fisher, Derek J., Associate Professor, Ph.D., University of Pittsburgh, 2006.

Hamilton-Brehm, Scott D., Assistant Professor, Ph.D., University of Georgia, 2008.

Jayakody, Lahiru, Assistant Professor, Ph.D., Kagoshima University (Japan), 2014.

Konjufca, Vjollca, Associate Professor, Ph.D., University of Arkansas Fayetteville, 2002.

Rader, Bethany, Associate Professor, Ph.D., University of Oregon, 2006.

Vargas-Muñiz, José M., Assistant Professor, Ph.D., Duke University, 2017.

Emeriti Faculty

Clark, David P., Professor, Emeritus, Ph.D., University of Bristol England, 1976.

Madigan, Michael T., Professor and Distinguished Scholar, Emeritus, Ph.D., University of Wisconsin, 1976.

Last updated: 07/18/2023