

# Microbiology and Immunology, B.S.

Microbiology and immunology are well-established disciplines within the life sciences. Microbiology addresses the biology of bacteria, viruses, and unicellular eukaryotes such as fungi and protozoa. Studies of microorganisms reveal basic information about processes in evolution, genetics, biochemistry, molecular biology, cell biology, structural biology, and ecology. Many bacteria, viruses, and protozoa cause disease in plants and animals. Hence, major areas of medicine and public health focus on these microorganisms.

Much of our knowledge in microbiology comes from the study of prokaryotic organisms, particularly bacteria. In addition to their relevance to infectious disease, these streamlined organisms provide a look at the basic requirements for life. The study of bacterial genetics has resulted in the creation of many genetic tools that are now used frequently to modify and study other organisms. Bacteria can also play an important role in the production of important materials such as biofuels and biopharmaceuticals. Understanding the behaviors of natural communities of bacteria and other organisms, called microbiomes, is an emerging field in our understanding of human health and disease.

The study of viruses (virology) is an important branch of microbiology that has contributed to our understanding of most of the fundamental processes in eukaryotic molecular biology, including the discovery of oncogenes. Viruses provide an excellent tool for the study of disease, cancer, and mechanisms of gene control. With the growing threat of emerging diseases, including global pandemics, and the potential for viral-based biological weapons, the study of virology has recently intensified and gained new perspectives.

Immunology encompasses efforts to understand how multicellular organisms have evolved to survive a variety of challenges to health and survival, including threats by pathogens and cancer cells. This includes an understanding of how the immune system develops, is activated, responds, and shuts down. Basic questions of how immunity functions are entwined with a fundamental understanding of the consequences of microbial infection, in a field called host-pathogen interactions. Immunology also encompasses the study of autoimmunity, the attack of the host by its own immune system, as well as the prevention of a response, known as immunological tolerance.

The major has been designed to span the interconnected disciplines of Microbiology and Immunology, and students have the opportunity to select courses from any of the following three areas: microbiology, immunology, or virology. The curricula overlap considerably, but there are unique courses for each discipline. The major is designed primarily for students who are serious about pursuing careers in microbiology and immunology and is intended to provide its graduates with the appropriate tools and training to successfully pursue professional and graduate degrees emphasizing these disciplines. These include Ph.D., M.D., and combined M.D./Ph.D. programs. Majoring in Microbiology and Immunology will also provide resources for serious students wishing to use a solid background in these disciplines for career goals in business, law, public and environmental policy, education, and other pursuits.

**Application Process to Declare the Major:** The major in Microbiology and Immunology is open to junior- and senior-level students only. Applications to declare the major can be made at the end of spring quarter, after all change of major requirements have been satisfied. Review of applications submitted at that time and selection to the major by the Microbiology and Immunology Faculty Board is completed during the summer. Information can also be found at the UCI Change of Major Criteria website (<http://www.changeofmajor.uci.edu/>). Double majors within the School of Biological Sciences or with Public Health Sciences, Biomedical Engineering: Premedical, Nursing Science, or Pharmaceutical Sciences are not permitted.

**All students must meet the University Requirements (<http://catalogue.uci.edu/informationforadmittedstudents/requirementsforabachelorsdegree/>).**

**All students must meet the School Requirements (<http://catalogue.uci.edu/charliedunlopschoolofbiologicalsciences/#schoolrequirements#text>).**

## Major Requirements for Microbiology and Immunology

A. Required Major Courses:	
BIO SCI M121	Immunology with Hematology
BIO SCI M122	General Microbiology
BIO SCI M124A	Virology
B. Upper-Division Laboratories:	
Select two from:	
BIO SCI M116L	Molecular Biology Laboratory
BIO SCI M118L	Experimental Microbiology Laboratory
BIO SCI M121L	Advanced Immunology Laboratory
C. Upper-Division Biology Electives:	
C1. Select at least four from the following:	
BIO SCI D139	Intercellular Signaling and Disease
BIO SCI E109	Human Physiology
BIO SCI E126	Parasitology
BIO SCI E134	Microbiomes

BIO SCI M119	Advanced Topics in Immunology
BIO SCI M124B	Viral Pathogenesis and Immunity
BIO SCI M125	Molecular Biology of Cancer
BIO SCI M131	Innate Immunity, Infection, and Pathogenesis
BIO SCI M137	Microbial Genetics
BIO SCI M143	Human Parasitology
BIO SCI M153	Vascular Biology: Blood Vessels in Health and Disease
BIO SCI M180	Biotechnological Applications of Energy and Environmental Research
BIO SCI N127	Foundations in Neuroimmunology
MOL BIO 205	Molecular Virology
C2. Select two from C1 or the following:	
BIO SCI D103	Cell Biology
BIO SCI D137	Eukaryotic and Human Genetics
BIO SCI M114	Advanced Biochemistry
BIO SCI M116	Advanced Molecular Biology
BIO SCI M144	Cell Organelles and Membranes
NOTE: No course may be used to satisfy more than one requirement.	

**Application Process to Declare the Major:** The major in Microbiology and Immunology is open to junior- and senior-level students only. Applications to declare the major can be made at any time, but typically in the spring of the sophomore year. Review of applications submitted at that time and selection to the major by the Microbiology and Immunology Faculty Board is completed during the summer. Information can also be found at the UCI Change of Major Criteria website (<http://www.changeofmajor.uci.edu/>). Double majors within the School of Biological Sciences or with Public Health Sciences, Biomedical Engineering: Premedical, Nursing Science, or Pharmaceutical Sciences are not permitted.

Freshman		
Fall	Winter	Spring
BIO SCI 93	BIO SCI 94	CHEM 1C- 1LC
BIO SCI 93L	BIO SCI 94L	STATS 7, 8, or MATH 5A (or General Education)
CHEM 1A	CHEM 1B	Lower-Division Writing <sup>1</sup>
General Education	Lower-Division Writing <sup>1</sup>	
BIO SCI 2A	General Education	
Sophomore		
Fall	Winter	Spring
BIO SCI 97	BIO SCI 98	BIO SCI 99
CHEM 51A	CHEM 51B- 51LB	CHEM 51C- 51LC
CHEM 1LD	MATH 5B (or General Education)	General Education
MATH 5A or 5B		
Junior		
Fall	Winter	Spring
PHYSICS 3A	PHYSICS 3B- 3LB	PHYSICS 3C- 3LC
BIO SCI M124A	U-D Bio Elective	BIO SCI M122
BIO SCI 100	BIO SCI M121	General Education or U-D Lab
BIO SCI 199	BIO SCI 199	BIO SCI 199
Senior		
Fall	Winter	Spring
U-D Biology Elective	U-D Biology Elective	U-D Biology Elective
BIO SCI M116L	U-D Biology Elective	U-D Biology Elective
BIO SCI 199	BIO SCI 199	BIO SCI 199

<sup>1</sup> Students have the option of taking HUMAN 1AS, HUMAN 1BS, HUMAN 1CS or WRITING 40, WRITING 50, WRITING 60 in order to fulfill the lower-division writing requirement.

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