

# DEPARTMENT OF MOLECULAR MICROBIOLOGY AND IMMUNOLOGY

## Mission Statement

The mission of the department is to conduct outstanding research and provide exceptional educational experiences in a collegial, diverse, and inclusive environment. At the same time, we transform academic experiences from classroom to careers by merging scholarly activities with practical skills in translational science, vaccine development, microbial pathogenesis, and immunology.

The Department of Molecular Microbiology and Immunology holds to the core values of integrity in academic studies and research; respect, diversity, and inclusion; responsibility and accountability; and fostering a culture of community and communication.

## General Information

The Department of Molecular Microbiology and Immunology connects outstanding research programs to the academic mission of preparing students for professional careers in microbiology and immunology, medical and public health service fields, education, research, and industry. The Department of Molecular Microbiology and Immunology is committed to providing students with foundations to link their educational experience to basic and translational biomedical research activities built by department faculty with expertise in the areas of vaccine development, microbial pathogenesis, and mechanisms of immune dysregulation in health and disease.

## Degrees

The Department of Molecular Microbiology and Immunology offers a Bachelor of Science (B.S.) degree in Microbiology and Immunology. The program of study is structured around a comprehensive core curriculum that includes upper-division level course work designed to achieve a deeper knowledge, understanding, and experience in several specialized areas of microbiology and immunology.

## Health Careers Pathways

The Department of Molecular Microbiology and Immunology offers programs that supports students interested in pursuing professional or graduate programs in health-related professions (e.g., the Medical Laboratory Science Early Acceptance Program-MSLEAP, a partnership program between UTSA and UT-Health San Antonio that allows undergraduate students to earn a B.S. degree from UTSA and a Master of Science in Medical Laboratory Sciences from UT-Health, and medical, pharmacy, and veterinarian among others). See the Degrees (p. 1) page for more information. Students can also visit the UTSA Health Professions office (<https://www.utsa.edu/healthprofessions/>) for more information.

## Sophomore Biology Research Initiative (SBRI)

The Sophomore Biology Research Initiative offers eligible second-year students to engage in authentic research with faculty and graduate students while earning academic credit. The opportunity to be part

of the SBRI is limited, students should register early. See the Degrees (p. 1) page for more information about SBRI.

## Bachelor of Science Degree in Microbiology and Immunology

The Bachelor of Science (B.S.) degree in Microbiology and Immunology is designed to prepare students for careers in the medical/health professions and service fields, research, education, and industry. The minimum number of semester credit hours required for degree, including the Core Curriculum requirements, is 120. Thirty-nine (39) of the total semester credit hours required for the degree must be at the upper-division level (3000-4000). All major and support work courses and the required prerequisites must be completed with a grade of "C-" or better.

Due to extensive curriculum overlap, students must choose between a B.S. in Biology or a B.S. in Microbiology and Immunology. All candidates for this degree must fulfill the Core Curriculum requirements and the degree requirements, which are listed below.

## Educational Objectives

Graduates with a B.S. in Microbiology and Immunology will be able to:

- Understand the foundations of host-pathogen interactions and immune-related diseases.
- Understand how to relate core methods of microbiology and immunology into the science of vaccine development, microbial pathogenesis, and human disease.
- Apply microbiology and immunology knowledge to solve current health problems.
- Effectively communicate microbiology- and immunology-related methods and results in written and oral form.

## Sophomore Biology Research Initiative

In the sophomore year, students can either take the required Molecular Genetics Laboratory (BIO 2362) and Molecular Biochemistry Laboratory (BIO 3362) or participate in the Sophomore Biology Research Initiative (SBRI). Through SBRI, students working in teams will conduct their own research projects on a specific biological problem over two semesters. Several different research topics will be available to choose from. There will be approximately two hours of lecture/lab meeting and six hours of lab work per week. Students will receive credit for BIO 2362 and BIO 3362 and be concurrently enrolled in three semester credit hours of Independent Study to reflect the additional hours required to complete their research. Students will present their final data in poster format at an organized symposium.

## Core Curriculum Requirements (42 semester credit hours)

Students seeking the B.S. Degree in Microbiology and Immunology must fulfill University Core Curriculum requirements in the same manner as other students. The courses listed below satisfy both degree requirements and Core Curriculum requirements; however, if these courses are taken to satisfy both requirements, then students may need to take additional courses in order to meet the minimum number of semester credit hours required for this degree.

MAT 1193 may be used to satisfy the core requirement in Mathematics as well as a major requirement. Two of the following courses may be used to satisfy the core requirement in Life and Physical Sciences, as well as major requirements: BIO 1203, BIO 1223, PHY 1943 or PHY 1963.

## Gateway Courses

Students pursuing the B.S. Degree in Microbiology and Immunology must successfully complete each of the following Gateway Courses with a grade of “C-” or better in no more than two attempts. A student who is unable to successfully complete these courses within two attempts, including dropping a course with a grade of “W” or taking an equivalent course at another institution, will be required to change his or her major.

Code	Title	Credit Hours
BIO 1203	Biosciences I for Science Majors	3
BIO 1223	Biosciences II for Science Majors	3
BIO 2313	Genetics	

## Degree Requirements

Code	Title	Credit Hours
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### A. Required major courses

#### 1. Required biology courses (27 credit hours):

BIO 1203 & BIO 1201	Biosciences I for Science Majors and Biosciences I Laboratory for Science Majors	4
BIO 1223 & BIO 1221	Biosciences II for Science Majors and Biosciences II Laboratory for Science Majors	4
BIO 2313	Genetics	3
BIO 3513	Biochemistry	3
NDRB 3813	Cell Biology	3
MMI 3713 & MMI 3722	Microbiology and Microbiology Laboratory	5
MMI 4743 & MMI 4752	Immunology and Immunology Laboratory	5

#### 2. One of the following laboratory options (4-7 credit hours):

##### Option 1 Standard Laboratory Classes

BIO 2362	Molecular Genetics Laboratory	
BIO 3362	Molecular Biochemistry Laboratory	

##### Option 2 Sophomore Biology Research Initiative

BIO 2362 & BIO 4911	Molecular Genetics Laboratory and Independent Study	
BIO 3362 & BIO 4912	Molecular Biochemistry Laboratory and Independent Study	

Note: In Laboratory Option 1, students will learn laboratory techniques in standard class setting. In Laboratory Option 2, students will learn laboratory techniques while conducting research on a specific biological problem over two semesters.

#### 3. In combination, 5 courses from the following lists (15 credit hours) 15

##### 3a. Complete two to four of the following courses:

MMI 3743	Bacteriology	
MMI 4483	Medical Mycology	
MMI 4723	Virology	
MMI 4763	Parasitology	

##### 3b. Complete one to three of the following courses:

MMI 3013	Introduction to Clinical Medicine and Pathology	
ES 3103	Environmental Microbiology	
MMI 3323	Evolution	

MMI 4473	Advanced Clinical Medicine and Pathology	
MMI 4773	Microbial Ecology and Metagenomics	
MMI 4783	Microbial Genomes and Virulence	
MMI 4923	Laboratory Research	
MMI 4953	Special Studies	

### B. Required support courses

The support courses listed below are mandatory prerequisites for various Microbiology and Immunology and/or Biology courses. Students need to complete their support work as soon as possible, in their freshman and sophomore years, to be eligible to register for upper-division core courses and electives. Failure to complete the support courses listed below in a timely fashion will significantly delay a student’s progress toward graduation.

#### 1. Required chemistry courses (18 credit hours):

CHE 1103 & CHE 1121	General Chemistry I and General Chemistry I Laboratory	4
CHE 1113 & CHE 1131	General Chemistry II and General Chemistry II Laboratory	4
CHE 2603 & CHE 2612	Organic Chemistry I and Organic Chemistry I Laboratory	5
CHE 3643 & CHE 3652	Organic Chemistry II and Organic Chemistry II Laboratory	5

#### 2. Required mathematics and statistics courses (6 credits):

MAT 1193	Calculus for the Biosciences	3
STA 1403	Probability and Statistics for the Biosciences	3

#### 3. Required physics courses; select one option (8 credits): 8

##### Option 1

PHY 1603 & PHY 1611	Algebra-based Physics I and Algebra-based Physics I Laboratory	
PHY 1623 & PHY 1631	Algebra-based Physics II and Algebra-based Physics II Laboratory	

##### Option 2

PHY 1943 & PHY 1951	Physics for Scientists and Engineers I and Physics for Scientists and Engineers I Laboratory	
PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory	

### C. Free electives (6-9 credit hours) 6-9

Select 6-9 semester credit hours of free electives, depending on the Laboratory Option chosen under section A2, to complete 120 hours. For students who selected Laboratory Option 1, at least 1 semester credit hour must be at the upper-division level to reach the minimum requirement of 39 upper-division semester credit hours.

**Total Credit Hours 87**

## Course Sequence Guide for B.S. Degree in Microbiology and Immunology

### B.S. in Microbiology and Immunology – Recommended Four-Year Academic Plan

#### First Year

Fall	Credit Hours
AIS 1203	Academic Inquiry and Scholarship (core) 3

BIO 1203 & BIO 1201	Biosciences I for Science Majors and Biosciences I Laboratory for Science Majors (core and major)	4
CHE 1103 & CHE 1121	General Chemistry I and General Chemistry I Laboratory	4
WRC 1013	Freshman Composition I (core)	3
<b>Credit Hours</b>		<b>14</b>

**Spring**

BIO 1223 & BIO 1221	Biosciences II for Science Majors and Biosciences II Laboratory for Science Majors (core and major)	4
CHE 1113 & CHE 1131	General Chemistry II and General Chemistry II Laboratory	4
MAT 1193	Calculus for the Biosciences (core and major)	3
WRC 1023	Freshman Composition II (core)	3
<b>Credit Hours</b>		<b>14</b>

**Second Year**
**Fall**

BIO 2313	Genetics	3
Select one of the following Laboratory Options:		2-3

Option 1 Standard Laboratory Class

BIO 2362 Molecular Genetics Laboratory

Or

Option 2 Sophomore Biology Research Initiative

 BIO 2362 Molecular Genetics Laboratory  
& BIO 4911 and Independent Study

CHE 2603 & CHE 2612	Organic Chemistry I and Organic Chemistry I Laboratory	5
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Select one of the following: 4

 PHY 1603 Algebra-based Physics I  
& PHY 1611 and Algebra-based Physics I  
Laboratory

Or

 PHY 1943 Physics for Scientists and  
& PHY 1951 Engineers I  
and Physics for Scientists and  
Engineers I Laboratory (core)

**Credit Hours 14-15**
**Spring**

Select one of the following Laboratory Options: 2-4

Option 1 Standard Laboratory Class

BIO 3362 Molecular Biochemistry Laboratory

Or

Option 2 Sophomore Biology Research Initiative

 BIO 3362 Molecular Biochemistry Laboratory  
& BIO 4912 and Independent Study

CHE 3643 & CHE 3652	Organic Chemistry II and Organic Chemistry II Laboratory	5
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STA 1403	Probability and Statistics for the Biosciences	3
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Select one of the following: 4

 PHY 1623 Algebra-based Physics II  
& PHY 1631 and Algebra-based Physics II  
Laboratory

Or		
PHY 1963 & PHY 1971	Physics for Scientists and Engineers II and Physics for Scientists and Engineers II Laboratory (core and major)	
<b>Credit Hours</b>		<b>14-16</b>

**Third Year**
**Fall**

BIO 3513	Biochemistry	3
MMI 3713	Microbiology	3
MMI 3722	Microbiology Laboratory	2
Upper-Division Microbiology and Immunology elective		3
American History (core)		3
Social & Behavioral Sciences (core)		3
<b>Credit Hours</b>		<b>17</b>

**Spring**

NDRB 3813	Cell Biology	3
MMI 4743	Immunology	3
MMI 4752	Immunology Laboratory	2
American History (core)		3
Creative Arts (core)		3
Upper-division free elective for those choosing Laboratory Option 1.		3-0
<b>Credit Hours</b>		<b>17</b>

**Fourth Year**
**Fall**

Upper-division Microbiology and Immunology elective		3
Upper-division Microbiology and Immunology elective		3
Government-Political Science (core)		3
Language, Philosophy, & Culture (core)		3
Free elective		3
<b>Credit Hours</b>		<b>15</b>

**Spring**

Upper-division Microbiology and Immunology elective		3
Upper-division Microbiology and Immunology elective		3
Government-Political Science (core)		3
Component Area Option (core)		3
Free elective (to meet 120 hour minimum)		0-3
<b>Credit Hours</b>		<b>15-12</b>

**Total Credit Hours 120**

Note: Some courses are only offered once a year: Fall or Spring. Check with the Department of Molecular Microbiology and Immunology for scheduling of courses.

## Molecular Microbiology and Immunology (MMI) Courses

### **MMI 1053. Introductory Microbiology. (3-0) 3 Credit Hours.**

Prerequisite: BIO 1233 or BIO 1203 (Formerly listed as BIO 1404 in previous catalogs); concurrent enrollment in MMI 1061 is recommended for students intending to complete both courses. A general study of microorganisms, their characteristics, isolation, growth, and importance in nature, particularly with regards to public health and human disease. (Formerly BIO 1053. Credit cannot be earned for both BIO 1053 and MMI 1053. MMI 1053 cannot substitute for MMI 3713.) Generally offered: Fall, Spring. Course Fees: LRS1 \$46.20; STSI \$21.60.

### **MMI 1061. Introductory Microbiology Laboratory. (0-3) 1 Credit Hour.**

Prerequisites: BIO 1233 or BIO 1203 (Formerly listed as BIO 1404 in previous catalogs), and completion of or concurrent enrollment in MMI 1053. Course provides basic microbiology lab skills and procedures, with emphasis on the growth, identification, and control of microbes of concern to health-care professionals. Immunodeficient and pregnant students must contact the Coordinator of the Microbiology Teaching Labs, for additional instructions prior to the class start date. (Formerly BIO 1061. Credit cannot be earned for both BIO 1061 and MMI 1061. MMI 1061 cannot substitute for MMI 3722.) Generally offered: Fall, Spring, Summer. Course Fees: IUB2 \$10; L001 \$30; LRS1 \$15.40; STSI \$7.20.

### **MMI 3013. Introduction to Clinical Medicine and Pathology. (3-0) 3 Credit Hours.**

Prerequisite: BIO 1233 or BIO 2313. Introduction to concepts of human disease, diagnosis, and underlying pathology. (Formerly BIO 3013. Credit cannot be earned for both BIO 3013 and MMI 3013.) Generally offered: Fall. Differential Tuition: \$150. Course fee: IUB2 \$10.

### **MMI 3323. Evolution. (3-0) 3 Credit Hours.**

Prerequisite: BIO 2313. A discussion of theories and possible mechanisms for evolutionary changes at various levels of organization. (Formerly BIO 3323. Credit cannot be earned for both BIO 3323 and MMI 3323.) Generally offered: Spring. Differential Tuition: \$150. Course fee: IUB2 \$10.

### **MMI 3713. Microbiology. (3-0) 3 Credit Hours.**

Prerequisite: BIO 1223 (Formerly listed as BIO 1414 in previous catalogs); concurrent enrollment in MMI 3722 is recommended for students intending to complete both courses. A comprehensive study of microorganisms, including their composition, morphology, growth, metabolism, classification, ecology, and significance in disease. MMI 1053 cannot substitute for MMI 3713. (Formerly BIO 3713. Credit cannot be earned for both MMI 3713, BIO 3713, and ES 3103.) Generally offered: Fall, Spring, Summer. Differential Tuition: \$150. Course fee: IUB2 \$10.

### **MMI 3722. Microbiology Laboratory. (0-4) 2 Credit Hours.**

Prerequisites: BIO 1223 (Formerly known as BIO 1414) and completion of or concurrent enrollment in MMI 3713. Basic microbiology techniques with emphasis on microscopy, cell staining and characterization, species isolation techniques, bacterial cultivation, nutrition, and physical requirements, and the physical and chemical control of microbes. Immunodeficient and pregnant students must contact the Coordinator of the Microbiology Teaching Labs for additional instructions prior to the class start date. (Formerly BIO 3722. Credit cannot be earned for both BIO 3722 and MMI 3722. BIO 1061 cannot substitute for MMI 3722.) Generally offered: Fall, Spring, Summer. Differential Tuition: \$100. Course Fees: IUB2 \$10; L001 \$30.

### **MMI 3743. Bacteriology. (3-0) 3 Credit Hours.**

Prerequisites: BIO 2313 and MMI 3713; prior completion of MMI 3722 is also recommended. A study of the phylogeny of prokaryotes, structure and function of prokaryotic cells, ecology and physiological diversity of prokaryotes, growth and control of microorganisms, genetics of bacteria and bacteriophages, bacteria as agents of disease, antibacterials, and other chemotherapeutics, human applications of microbiology, microbial genomics, and principles of microbial biotechnology. (Formerly BIO 3743. Credit cannot be earned for both BIO 3743 and MMI 3743.) Generally offered: Fall. Differential Tuition: \$150. Course fee: IUB2 \$10.

### **MMI 4473. Advanced Clinical Medicine and Pathology. (3-0) 3 Credit Hours.**

Prerequisite: MMI 3013. Advanced concepts of human disease, diagnosis, and underlying pathology. (Formerly BIO 4473. Credit cannot be earned for both BIO 4473 and MMI 4473.) Generally offered: Spring. Differential Tuition \$150. Course fee: IUB2 \$10.

### **MMI 4483. Medical Mycology. (3-0) 3 Credit Hours.**

Prerequisites: MMI 3713 and MMI 3722. Comprehensive study of causative agents, pathogenesis, and treatment of human fungal diseases. (Formerly BIO 4483. Credit cannot be earned for both BIO 4483 and MMI 4483.) Generally offered: Spring. Differential Tuition \$150. Course fee: IUB2 \$10.

### **MMI 4723. Virology. (3-0) 3 Credit Hours.**

Prerequisite: BIO 2313, prior completion of BIO 3513 is strongly recommended. Introduction to the molecular, genetic, and biological properties of viruses. Course covers the basic concepts of virus structure, replication, virus/host interactions, pathogenesis, and evolution. (Formerly BIO 4723. Credit cannot be earned for both BIO 4723 and MMI 4723.) Generally offered: Fall and Spring. Differential Tuition: \$150. Course fee: IUB2 \$10.

### **MMI 4743. Immunology. (3-0) 3 Credit Hours.**

Prerequisite: BIO 2313; concurrent enrollment in MMI 4752 is recommended for students intending to complete both courses. This course introduces students to the molecular, cellular, and genetic principles of innate and adaptive immunity. The course covers the development of B and T lymphocytes, and explains how these components of adaptive immunity function in the contexts of infection by pathogenic microbes, allergic reactions, autoimmunity, transplant rejection, cancer, and vaccination. (Formerly BIO 4743. Credit cannot be earned for both BIO 4743 and MMI 4743.) Generally offered: Fall, Spring, Summer. Differential Tuition: \$150. Course fee: IUB2 \$10.

### **MMI 4752. Immunology Laboratory. (0-4) 2 Credit Hours.**

Prerequisites: BIO 2313, BIO 2362 or BIO 2322, and completion of or concurrent enrollment in MMI 4743. Laboratory applications of principles presented in MMI 4743. (Formerly BIO 4752. Credit cannot be earned for both BIO 4752 and MMI 4752.) Generally offered: Fall, Spring, Summer. Differential Tuition: \$100. Course Fees: IUB2 \$10; L001 \$30.

### **MMI 4763. Parasitology. (3-0) 3 Credit Hours.**

Prerequisite: BIO 2313; prior completion of MMI 3713 is strongly recommended. This course focuses on eukaryotic parasites of medical or veterinary importance: their life cycles, epidemiology, control, and the diseases and pathology they cause. Evolutionary aspects of host-parasite interactions, the diversity of parasite biology, and the interrelationships between parasitology, vector biology, and public health will be emphasized. (Formerly BIO 4763. Credit cannot be earned for both BIO 4763 and MMI 4763.) Generally offered: Spring. Differential Tuition \$150. Course fee: IUB2 \$10.

**MMI 4773. Microbial Ecology and Metagenomics. (3-0) 3 Credit Hours.**

Prerequisites: BIO 2313 and MMI 1053 or MMI 3713. This course will provide an overview of microbial ecology principles and application of microbial ecological approaches to understand microbial structure and function across environments, including the soil, freshwater, and marine environments. The course will focus its content on prokaryotes and fungi. An emphasis in this course will be on learning foundational concepts in microbiome science and applying concepts to laboratory and computational techniques through hands-on experiments. (Same as BIO 4773, credit cannot be earned for both BIO 4773 and MMI 4773.) Generally offered: Fall, Spring. Differential Tuition: \$150. Course fee: IUB2 \$10.

**MMI 4783. Microbial Genomes and Virulence. (3-0) 3 Credit Hours.**

Prerequisite: BIO 2313; prior completion of MMI 3713 is recommended. This course is focused on microbial pathogens of medical importance. Insights into the genome make-up and virulence inventories of pathogens is essential for understanding their biology, epidemiology, human disease, and trajectories of pathogen evolution. Topics covered include the basic concepts of genome sequencing, pathogen-specific virulence traits, and the role of genetic exchange in genome evolution, speciation, fitness, and pathogenicity. (Formerly BIO 4783. Credit cannot be earned for both BIO 4783 and MMI 4783.) Generally offered: Spring. Differential Tuition \$150. Course fee: IUB2 \$10.

**MMI 4911. Independent Study. (0-0) 1 Credit Hour.**

Prerequisites: Permission in writing (form available in the MMI office) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours will apply to a bachelor's degree regardless of discipline. Only 6 semester credit hours of BIO 3043, MMI 4911-3, MMI 4923, and MMI 4993, in any combination, can be taken as MMI electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: \$50. Course fee: IUB2 \$10.

**MMI 4912. Independent Study. (0-0) 2 Credit Hours.**

Prerequisites: Permission in writing (form available in the MMI office) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours will apply to a bachelor's degree regardless of discipline. Only 6 semester credit hours of BIO 3043, MMI 4911-2, MMI 4923, and MMI 4993, in any combination, can be taken as MMI electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: \$100. Course fee: IUB2 \$10.

**MMI 4913. Independent Study. (0-0) 3 Credit Hours.**

Prerequisites: Permission in writing (form available in the MMI office) from the instructor, an undergraduate academic advisor, the Department Chair, and the Dean of the College in which the course is offered. Independent reading, research, discussion, and/or writing under the direction of a faculty member. May be repeated for credit, but no more than 6 semester credit hours will apply to a bachelor's degree regardless of discipline. Only 6 semester credit hours of BIO 3043, MMI 4911-3, MMI 4923, and MMI 4993, in any combination, can be taken as MMI electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: \$150. Course fee: IUB2 \$10.

**MMI 4923. Laboratory Research. (0-6) 3 Credit Hours.**

Prerequisites: Permission in writing (form available in the MMI Department Office) from the faculty mentor, the student's advisor, the Department Chair, and the Dean of the College. Supervised laboratory research mentored by a faculty member engaged in active research within the student's designated area of concentration. May be repeated for credit, but no more than 6 semester credit hours will apply to a bachelor's degree. Only 6 semester credit hours of BIO 3043, BIO 4911-3, MMI 4923, and MMI 4993, in any combination, can be taken as MMI electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring, Summer. Differential Tuition: \$150. Course fees: L001 \$30; IUB2 \$10.

**MMI 4953. Special Studies. (3-0) 3 Credit Hours.**

An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Studies may be repeated for credit when the topics vary, but no more than 6 semester credit hours will apply to a bachelor's degree regardless of discipline. No more than 6 semester hours of MMI 2953, MMI 4951, or MMI 4953 can be applied to a B.S. degree in MMI. Generally offered: Fall, Spring, Summer. Differential Tuition: \$150. Course fee: IUB2 \$10.

**MMI 4993. Honors Research. (0-0) 3 Credit Hours.**

Enrollment limited to Microbiology and Immunology majors who are members of the Honors College or who are pursuing College of Sciences Honors, and who are in their last two semesters of study. Approval by the Honors College or College Honors Committee is required. This course requires supervised research and preparation of an Honors Thesis. May be repeated for credit with approval, but no more than 6 semester credit hours will apply to a bachelor's degree regardless of discipline. Only 6 semester credit hours of MMI 4911-3, MMI 4923, and MMI 4993, in any combination, can be taken as MMI electives. Additional research hours of these courses (excluding Independent Study) may be taken as free electives, for a maximum of 12 research hours being applied to the bachelor's degree. Generally offered: Fall, Spring. Differential Tuition: \$150. Course fee: IUB2 \$10.