

DEPARTMENT OF MOLECULAR MICROBIOLOGY AND IMMUNOLOGY

Mission Statement

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 molecular mechanisms that determine immune responses in health and disease.

The Department of Molecular Microbiology and Immunology offers a Doctor of Philosophy (Ph.D.) degree in Molecular Microbiology and Immunology. The program of study is structured around a comprehensive core curriculum that includes Principles of Immunology and Principles of Microbiology, and a “primer” core class named Genes, Microbes and Disease, that intends to bridge areas of research at the molecular and cellular level with various research topics currently pursued by members of the Department. Core courses on Principles of Scientific Writing and Teaching in Life Sciences are structured to provide formal training in writing grants/ research publications and effective tools for developing learning environments in life sciences, respectively. Supporting prescribed electives include specialized courses that focus on advanced topics in immunology, mycology, bacteriology, virology, and informatics, among others, designed to provide in-depth knowledge at the frontiers of the areas of research to be pursued by prospective students. The collective goal of core and elective courses in the curriculum is to provide both foundational and specialized knowledge in areas of Molecular Microbiology and Immunology to guide doctoral students towards a field of study of their choice. Doctoral and Dissertation Research courses are intended to provide robust hands-on and minds-on, research-based training to generate significant findings advancing the student’s field of study and resulting in peer-reviewed publications.

The mission of the Department of Molecular Microbiology and Immunology 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 fundamental and translational aspects of science in conjunction with a general and discipline-specific Professional Development Program intended to guide students into various career paths.

Core Values

Integrity in academic studies and research.

Respect, diversity, and inclusion.

Responsibility and accountability.

Foster a culture of community and communication.

Doctor of Philosophy Degree in Molecular Microbiology and Immunology

The Department of Molecular Microbiology and Immunology offers opportunities for advanced study and research leading to the Doctor of Philosophy degree.

The goals of the program are:

- To educate, mentor, and sponsor the next generation of scientists specialized in the study of mechanisms leading to diseases caused by microorganisms, host immune response to infectious and non-pathogenic microorganisms, and diseases arising from immune dysfunction.
- To advance multi-disciplinary training and research portfolios within UTSA and other research entities in San Antonio.
- To meet the workforce needs of academic institutions and also of industries specialized in biotechnology, biodefense, and healthcare.
- To guide students towards a variety of career paths with general and discipline-specific Professional Development Plans.

Student Learning Outcomes

Upon completion of the Molecular Microbiology and Immunology Degree, students will be proficient in:

- Demonstrating knowledge and comprehension of the foundations of the immune systems in various hosts, microbial pathogenesis, host-pathogen interactions, microbial and host genomics, and biology of diseases of the immune system.
- Designing and executing experiments and applying the scientific method.
- Applying cutting-edge knowledge and experimental tools in microbiology and immunology to solve current health challenges.
- Effectively communicating molecular microbiology and immunology concepts, methods, and results from basic research in written and oral forms.

Admission Requirements

Applicants must satisfy the University-wide graduate admission requirements described in the graduate catalog. In addition, they must satisfy one of the following MMI Ph.D. Program-specific requirements.

1. Hold a Bachelor of Arts or a Bachelor of Science degree in STEM with a minimum grade point average of 3.0 in upper-division courses in Microbiology or Biosciences with course curriculum including but not limited to, biology, genetics, microbiology, or immunology.
2. A Master’s degree in STEM, preferably in Biology, Microbiology and Immunology, Biotechnology, or related field is preferable.

Admission to the program is decided based on a holistic approach that includes the applicant’s personal statement, course work, letters of reference, evidence of research experience, and one or more online or in-person interviews.

Complete applications must include:

1. Official transcripts.
2. Three letters of recommendation from persons familiar with the applicant’s academic potential.
3. A statement of research/specialization interest and description of prior research experience.

4. Resumé/curriculum vita with a list of publications or scholarly products.
5. For International Applicants only: Test of English as a Foreign Language (TOEFL) with minimum scores of 100 or 550 for Internet or paper versions are recommended.

Degree Requirements

The degree requires 75 semester credit hours (SCH) for students entering with a Bachelor of Arts or a Bachelor of Science degree, or 66 SCH for students entering with a Master's Degree. The curriculum consists of core courses, courses in scientific writing and scientific teaching, elective courses, seminars, and dissertation research. Any grade lower than "B" in graduate courses or in leveling coursework at the undergraduate level will not count toward the Ph.D. degree.

A. Core Curriculum (15 semester credit hours required) 15

MMI 5513	Genes, Microbes and Disease
MMI 5553	Principles of Immunology
MMI 5573	Principles of Microbiology
MMI 7113	Teaching in Life Sciences
MMI 7143	Principles of Scientific Writing

B. Electives (15 semester credit hours selected from the courses below) 15

MMI 6323	Biostatistics
MMI 6643	Introduction to Bioinformatics
MMI 6513	Drug Development
MMI 6543	Vaccine Development
MMI 6613	Introduction to Clinical Medicine and Pathology
MMI 6713	Advanced Clinical Medicine and Pathology
MMI 6743	Advanced Virology
MMI 6803	Advanced Immunology
MMI 6883	Bacterial Pathogenesis
MMI 6733	Advanced Medical Mycology
MMI 6923	Advanced Microbial Bioinformatics
MMI 6933	Data Analysis and Visualization for Biologists
MMI 6973	Special Topics

Students can alternatively take any 5000-7000 level course offered at UTSA with approval from the Molecular Microbiology and Immunology Doctoral Studies Committee.

C. Colloquia (5 semester credit hours selected from the courses below) 5

MMI 7001	Professional and Leadership Development
MMI 7031	Graduate Student Seminar: Acquiring Presentation Skills
MMI 7041	Molecular Microbiology and Immunology Colloquium (Microbiology)
MMI 7041	Molecular Microbiology and Immunology Colloquium (Highlights in Immunology)
MMI 7041	Molecular Microbiology and Immunology Colloquium (Neuroimmunology)
MMI 7041	Molecular Microbiology and Immunology Colloquium (Vector-Borne diseases)
MMI 7041	Molecular Microbiology and Immunology Colloquium (Biofilms)
MMI 7041	Molecular Microbiology and Immunology Colloquium (Antifungal Drugs)

MMI 7051	Molecular Microbiology and Immunology Seminar	
D. Doctoral Research (40 semester credit hours required)		40
MMI 7571 or MMI 7572	Doctoral Rotation	
MMI 7211 – MMI 7216	Doctoral Research	
MMI 7311 – MMI 7316	Doctoral Dissertation	
Total Credit Hours		75

Advancement to Candidacy

Advancement to candidacy requires a student to complete all the program requirements and to pass written and oral qualifying examinations following completion of core and a majority of elective courses. The written qualifying exam is administered in connection with the Principles of Immunology and Principles of Microbiology core courses. The oral qualifying exam is based on the dissertation research proposal and is administered by a five-member Oral Qualifying Exam Committee made up of tenured, tenure-track, or adjunct faculty. The qualifying exam is conducted as outlined in the Handbook of Academic Policies and Procedures for the Ph.D. Program. in Molecular Microbiology and Immunology. Students are allowed two additional attempts to pass their oral qualifying examination. Results of the written and oral examinations must be reported to the Doctoral Studies Committee and the Dean of the Graduate School. Admission into the Doctoral program does not guarantee advancement to candidacy.

Dissertation

Candidates must demonstrate their ability to conduct independent research by completing and defending an original dissertation. The research topic is determined by the student in consultation with their supervising professor and a Dissertation Committee. The Dissertation Committee is selected by the student and supervising professor and approved following guidelines of the UTSA Graduate School. The Dissertation Committee guides and critiques the candidate's research. The Committee is composed of four program faculty and one outside member. The Dissertation Committee must approve the completed dissertation.

Final Oral Examination

Following an open presentation of the dissertation findings, the Dissertation Committee conducts a closed oral examination dealing primarily with the relation of the dissertation to the general field of specialty. Results of the oral examination must be reported to the Dean of the Graduate School. Awarding of the degree is based on the approval of the Dissertation Committee, which is approved by the relevant Doctoral Studies Committee, the Department Chair, and the Dean of the Graduate School. The Dean of the Graduate School certifies the completion of all University-wide requirements.

Molecular Microbiology and Immunology (MMI) Courses

MMI 5513. Genes, Microbes and Disease. (3-0) 3 Credit Hours.

Prerequisite: BIO 3513 or equivalent. Primer course that bridges molecular and cell biology, molecular structure and function of genes and nucleic acids, in the focused area of host-pathogen interactions. Genome projects, functional genomics, and the genetic control of development will also be covered. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 5553. Principles of Immunology. (3-0) 3 Credit Hours.

Prerequisite: BIO 3513 or equivalent. A study of cellular and molecular interaction between cells and molecules of the immune system and principles of immune system function. Topics include immune system development, humoral and cell-mediated immunity, disease and treatments, immunization, immunodeficiency, and autoimmunity. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 5573. Principles of Microbiology. (3-0) 3 Credit Hours.

Prerequisite: BIO 3513 and BIO 3713, or equivalents. A study of the cellular and molecular mechanisms by which bacterial, eukaryotic, parasitic and viral pathogens cause disease and the host immune responses against these pathogens. (Credit cannot be earned for both MMI 5573 and BIO 6573.) This course is available to Master and Doctoral students. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 5971. Directed Research. (0-0) 1 Credit Hour.

The directed research course may involve either a laboratory or a theoretical problem. May be repeated for credit, but not more than 6 hours, regardless of discipline, in combination with MMI 6951, MMI 6952, and MMI 6953 (Independent Study), will apply to the Master's degree. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 5972. Directed Research. (0-0) 2 Credit Hours.

The directed research course may involve either a laboratory or a theoretical problem. May be repeated for credit, but not more than 6 hours, regardless of discipline, in combination with MMI 6951, MMI 6952, and MMI 6953 (Independent Study), will apply to the Master's degree. Differential Tuition: \$100. Course fee: GS01 \$60.

MMI 5973. Directed Research. (0-0) 3 Credit Hours.

The directed research course may involve either a laboratory or a theoretical problem. May be repeated for credit, but not more than 6 hours, regardless of discipline, in combination with MMI 6951, MMI 6952, and MMI 6953 (Independent Study), will apply to the Master's degree. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6323. Biostatistics. (3-0) 3 Credit Hours.

This course involves basic, intermediate, and advanced statistical vocabulary, concepts, and methods commonly used in the biomedical research. Concepts and appropriate selections of test/study design using power analyses and estimations of sample sizes; also for clinical trials. Analytical calibration curves, frequency distributions, descriptive statistics, measures of central tendency and dispersion/error, probability, paired and unpaired, one-tailed and two-tailed t-tests, correlations, regression, one-way and two-way analysis of variance with repeated measures, parametric and nonparametric tests, post hoc tests for significance, reporting and interpretations of statistical results, validations of clinical tests for specificity, sensitivity, predictive values, likelihood ratios, and receiver operating characteristic curves. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6513. Drug Development. (3-0) 3 Credit Hours.

This course will provide students with an overview of the early drug discovery process, including target identification, validation, assay development, and high throughput screening up to pre-clinical trials. (Same as BIO 6513. Credit cannot be earned for both MMI 6513 and BIO 6513.) This course is available to Master and Doctoral students. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6543. Vaccine Development. (3-0) 3 Credit Hours.

This course will provide students with an overview of issues about the roles of vaccines in the control of infectious diseases, vaccine development, clinical trials, and implementation of vaccine programs. (Same as BIO 6543. Credit cannot be earned for both MMI 6543 and BIO 6543.) This course is available to Master and Doctoral students. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6613. Introduction to Clinical Medicine and Pathology. (3-0) 3 Credit Hours.

Prerequisite: Graduate standing. Introduction to concepts of human disease, diagnosis, and underlying pathology. This course is available to Master and Doctoral students. Generally offered: Fall. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6643. Introduction to Bioinformatics. (3-0) 3 Credit Hours.

The ability to sequence and analyze genomes has transformed biology. The genomic revolution has been made possible by the development of bioinformatics tools that combine computation with principles of molecular biology. In this course, students will learn how to use some of the major bioinformatics tools and will examine a few genomes to understand the vast amount of information present in them. This course is available to Master and Doctoral students. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6713. Advanced Clinical Medicine and Pathology. (3-0) 3 Credit Hours.

Prerequisite: MMI 3013 or MMI 6613. Advanced concepts of human disease, diagnosis, and underlying pathology. This course is available to Master and Doctoral students. Generally offered: Spring. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6733. Advanced Medical Mycology. (3-0) 3 Credit Hours.

Prerequisite: BIO 3522 and BIO 3722 or equivalents. A comprehensive study of the etiological agents and host factors that lead to fungal disease in humans. This course is available to Master and Doctoral students. (Same as BIO 5733. Credit cannot be earned for both MMI 6733 and BIO 5733.) Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6743. Advanced Virology. (3-0) 3 Credit Hours.

Prerequisite: Graduate standing. A study of the diversity of animal viruses with emphasis on the molecular details of genome replication, gene expression, and pathogenesis. (Same as BIO 5743. Credit cannot be earned for both MMI 5743 and BIO 5743.) This course is available to Master and Doctoral students. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6803. Advanced Immunology. (3-0) 3 Credit Hours.

Prerequisite: BIO 4743 or consent of instructor. Advanced applications of current molecular and cellular concepts of humoral and cell-mediated immunity, with emphasis on host-pathogen interactions, experimental design, and immunological technologies. This course is available to Master and Doctoral students. (Same as BIO 6803. Credit cannot be earned for both MMI 6803 and BIO 6803.) Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6883. Bacterial Pathogenesis. (3-0) 3 Credit Hours.

Prerequisite: BIO 3713 and BIO 4743, or consent of instructor. This course will present a selection of topics in the field of bacterial pathogenesis. Lectures will cover regulation of virulence, colonization and host tissue damage, vaccines, antibiotics, and novel antimicrobials, evasion of the immune system, intracellular pathogens, pathogenic mechanisms of Gram-negative and Gram-positive bacteria, pathogenic mycobacteriology, and experimental tools in bacterial pathogenesis. (Same as BIO 6883. Credit cannot be earned for both MMI 6883 and BIO 6883.) Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6923. Advanced Microbial Bioinformatics. (3-0) 3 Credit Hours.

Prerequisite: BIO 2313 or equivalent; MMI 6643, enrollment in Molecular Microbiology and Immunology Ph.D. program required, or permission of the Molecular Microbiology and Immunology Department or instructor. With the advent of next generation sequencing (NGS), genomes and transcriptomes are being added at ever growing rates to the public sequence repositories, which poses challenges for comprehensive data analyses and mining. In this course, students will learn and apply bioinformatics tools and strategies - from the profiling of individual genomes to large-scale multi-isolate comparisons - to harvest the rich information content that can be found in big sequence data. This course focuses on microbial genomics/transcriptomics/evolution with focus on pathogens. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6933. Data Analysis and Visualization for Biologists. (3-0) 3 Credit Hours.

An introduction to modern techniques used by data scientists; including data organization, manipulation, analysis, visualization, and in silico experimentation. Students will be taught how to use an open-source data science platform (KNIME) to design a workflow specific to their research project. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6951. Independent Study. (0-0) 1 Credit Hour.

This course involves independent reading, research, discussion, and/or writing under the direction of a faculty member. This course is for students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, in combination with MMI 5971, MMI 5972, and MMI 5973 (Independent Study), will apply to the Master's degree. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 6952. Independent Study. (0-0) 2 Credit Hours.

This course involves independent reading, research, discussion, and/or writing under the direction of a faculty member. This course is for students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, in combination with MMI 5971, MMI 5972, and MMI 5973 (Independent Study), will apply to the Master's degree. Differential Tuition: \$100. Course fee: GS01 \$60.

MMI 6953. Independent Study. (0-0) 3 Credit Hours.

This course involves independent reading, research, discussion, and/or writing under the direction of a faculty member. This course is for students needing specialized work not normally or not often available as part of the regular course offerings. May be repeated for credit, but not more than 6 hours, regardless of discipline, in combination with MMI 5971, MMI 5972, and MMI 5973 (Independent Study), will apply to the Master's degree. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6973. Special Topics. (3-0) 3 Credit Hours.

Prerequisite: Consent of instructor. An organized course offering the opportunity for specialized study not normally or not often available as part of the regular course offerings. Special Topics courses may be repeated for credit if the topics vary. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 6981. Master's Thesis. (0-0) 1 Credit Hour.

Corequisites: Enrollment in MMI 6981, MMI 6982, or MMI 6983 is required each term in which the thesis is in progress. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 6982. Master's Thesis. (0-0) 2 Credit Hours.

Corequisites: Enrollment in MMI 6981, MMI 6982, or MMI 6983 is required each term in which the thesis is in progress. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Differential Tuition: \$100. Course fee: GS01 \$60.

MMI 6983. Master's Thesis. (0-0) 3 Credit Hours.

Corequisites: Enrollment in MMI 6981, MMI 6982, or MMI 6983 is required each term in which the thesis is in progress. Thesis research and preparation. May be repeated for credit, but not more than 6 hours will apply to the Master's degree. Credit will be awarded upon completion of the thesis. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 7001. Professional and Leadership Development. (1-0) 1 Credit Hour.

This course focuses on building individual development plans and integration of professional and leadership skills. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7031. Graduate Student Seminar: Acquiring Presentation Skills. (1-0) 1 Credit Hour.

This course includes oral presentations, discussions, critical evaluation of students' research in progress, or support preparation of manuscripts/reviews by students to publish their data sets. May be repeated for credit. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7041. Molecular Microbiology and Immunology Colloquium. (1-0) 1 Credit Hour.

Prerequisite: Graduate standing. This course includes oral presentations, discussions, critical evaluation of students' research in progress, or discussions of current journal articles or reviews of recent scientific advances. May be repeated for credit if topic varies. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7051. Molecular Microbiology and Immunology Seminar. (1-0) 1 Credit Hour.

Prerequisite: Graduate standing. This course includes formal presentations of research by outside authorities in the biological sciences. May be repeated for credit. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7113. Teaching in Life Sciences. (3-0) 3 Credit Hours.

Prerequisite: Admission to candidacy for the Doctoral degree. Required course for Molecular Microbiology and Immunology doctoral students. The student will be responsible for all aspects of leading a discussion section or laboratory course. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 7143. Principles of Scientific Writing. (3-0) 3 Credit Hours.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree. This course will provide an overview of scientific grant and manuscript preparation. The class will be directed toward producing a Ph.D. dissertation proposal and a predoctoral fellowship application. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 7211. Doctoral Research. (0-0) 1 Credit Hour.

Prerequisite: Admission to Molecular Microbiology and Immunology Doctoral program. May be repeated for credit, but no more than 27 hours may be applied to the Doctoral degree. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7212. Doctoral Research. (0-0) 2 Credit Hours.

Prerequisite: Admission to Molecular Microbiology and Immunology Doctoral program. May be repeated for credit, but no more than 27 hours may be applied to the Doctoral degree. Differential Tuition: \$100. Course fee: GS01 \$60.

MMI 7213. Doctoral Research. (0-0) 3 Credit Hours.

Prerequisite: Admission to Molecular Microbiology and Immunology Doctoral program. May be repeated for credit, but no more than 27 hours may be applied to the Doctoral degree. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 7214. Doctoral Research. (0-0) 4 Credit Hours.

Prerequisite: Admission to either the Molecular Microbiology and Immunology, Neuroscience, or Cell and Molecular Biology Doctoral program. May be repeated for credit, but no more than 27 hours may be applied to the Doctoral degree. Differential Tuition: \$200. Course fee: GS01 \$120.

MMI 7215. Doctoral Research. (0-0) 5 Credit Hours.

Prerequisite: Admission to either the Molecular Microbiology and Immunology, Neuroscience, or Cell and Molecular Biology Doctoral program. May be repeated for credit, but no more than 27 hours may be applied to the Doctoral degree. Differential Tuition: \$250. Course fee: GS01 \$150.

MMI 7216. Doctoral Research. (0-0) 6 Credit Hours.

Prerequisite: Admission to Molecular Microbiology and Immunology Doctoral program. May be repeated for credit, but no more than 27 hours may be applied to the Doctoral degree. Differential Tuition: \$300. Course fee: GS01 \$180.

MMI 7311. Doctoral Dissertation. (0-0) 1 Credit Hour.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree and completion of at least 1-6 semester credit hours of MMI 7211, MMI 7212, MMI 7213, MMI 7214, MMI 7215, or MMI 7216. May be repeated for credit, but no more than 45 hours may be applied to the Doctoral degree. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7312. Doctoral Dissertation. (0-0) 2 Credit Hours.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree and completion of at least 1-6 semester credit hours of MMI 7211, MMI 7212, MMI 7213, MMI 7214, MMI 7215, or MMI 7216. May be repeated for credit, but no more than 45 hours may be applied to the Doctoral degree. Differential Tuition: \$100. Course fee: GS01 \$60.

MMI 7313. Doctoral Dissertation. (0-0) 3 Credit Hours.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree and completion of at least 1-6 semester credit hours of MMI 7211, MMI 7212, MMI 7213, MMI 7214, MMI 7215, or MMI 7216. May be repeated for credit, but no more than 45 hours may be applied to the Doctoral degree. Differential Tuition: \$150. Course fee: GS01 \$90.

MMI 7314. Doctoral Dissertation. (0-0) 4 Credit Hours.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree and completion of at least 1-6 semester credit hours of MMI 7211, MMI 7212, MMI 7213, MMI 7214, MMI 7215, or MMI 7216. May be repeated for credit, but no more than 45 hours may be applied to the Doctoral degree. Differential Tuition: \$200. Course fee: GS01 \$120.

MMI 7315. Doctoral Dissertation. (0-0) 5 Credit Hours.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree and completion of at least 1-6 semester credit hours of MMI 7211, MMI 7212, MMI 7213, MMI 7214, MMI 7215, or MMI 7216. May be repeated for credit, but no more than 45 hours may be applied to the Doctoral degree. Differential Tuition: \$250. Course fee: GS01 \$150.

MMI 7316. Doctoral Dissertation. (0-0) 6 Credit Hours.

Prerequisite: Admission to candidacy for the Molecular Microbiology and Immunology Doctoral degree and completion of at least 1-6 semester credit hours of MMI 7211, MMI 7212, MMI 7213, MMI 7214, MMI 7215, or MMI 7216. May be repeated for credit, but no more than 45 hours may be applied to the Doctoral degree. Differential Tuition: \$300. Course fee: GS01 \$180.

MMI 7571. Doctoral Rotation. (0-0) 1 Credit Hour.

Prerequisite: Admission to the Molecular Microbiology and Immunology Ph.D. program. This course allows students to perform laboratory-based research under the direction of a Molecular Microbiology and Immunology faculty member. Students will receive mentoring and training in the areas of experimental design, experimentation, data acquisition, data analysis, and presentation (oral/written). May be repeated for credit, but no more than 6 hours may be applied to the Doctoral degree. Differential Tuition: \$50. Course fee: GS01 \$30.

MMI 7572. Doctoral Rotation. (0-0) 2 Credit Hours.

Prerequisite: Admission to the Molecular Microbiology and Immunology Ph.D. program. This course allows students to perform laboratory-based research under the direction of a Molecular Microbiology and Immunology faculty member. Students will receive mentoring and training in the areas of experimental design, experimentation, data acquisition, data analysis, and presentation (oral/written). May be repeated for credit, but no more than 6 hours may be applied to the Doctoral degree. Differential Tuition: \$100. Course fee: GS01 \$60.