

# Department of Microbiology, Molecular Genetics, and Immunology

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The mission of the Department of Microbiology, Molecular Genetics and Immunology is to conduct high impact research that is relevant to human health and train the next generation of biomedical scientists and physicians who will advance our understanding of infection and immunity in ways that benefit humankind.

Our nationally recognized research programs, highly supported by NIH research funding, cover a variety of topics within the following themes:

- microbial physiology and pathogenesis
- virology
- immunology and host defense

Funding also provides support for pre- and postdoctoral trainees and visiting scientists, as well as for hosting national and international researchers in the Microbiology seminar series.

## Courses

### **MICR 801. Principles of Immunology. 1 Credits.**

An introductory course in immunology; cells and tissues of the immune system; B and T cells and their receptors; major histocompatibility complex; antigen presentation; regulation of immune responses; immunity and vaccination. Prerequisite: IGPBS courses or permission of instructor.

### **MICR 802. Principles of Virology. 1 Credits.**

An introductory course in virology; replication of RNA and DNA viruses; viral RNA processing and translation; reverse transcription; virus assembly; viral pathogenesis; viruses as vectors. Prerequisite: MICR 801 or permission of instructor.

### **MICR 803. Principles of Bacterial Genetics and Pathogenesis. 1 Credits.**

An introductory course in bacteriology; cell structure and function; chromosome and plasmid replication; genetic engineering; bacteriophage; gene regulation; quorum sensing; antibiotics; protein secretion; bacterial pathogenesis. Prerequisite: MICR 801 & MICR 802 or permission of instructor.

### **MICR 804. Science Communication. 1 Credits.**

MICR 804. Science Communication. This 1-credit course is designed for students pursuing a graduate degree (PhD or MS) in a biomedical field. This course seeks to provide students with not just experience, but training in science communication, including both oral presentations and written communication. The goal of the course is to equip students with techniques and experience communicating to fellow scientists and non-science audiences, thus better equipping students with key skills necessary for a future in science regardless of career path. Prerequisite: An introductory course in biology, genetics, chemistry or biochemistry.

### **MICR 805. Teaching in Higher Education. 3 Credits.**

Theoretical and practical aspects of teaching in a graduate degree program with emphasis on program and curriculum design, student assessment, communicating learning expectations, selecting optimal teaching methods aligned with expectations, understanding diverse

learning styles, apprenticeship teaching, developing as a teacher and applying contemporary educational theory to the classroom or research laboratory. Prerequisite: Any graduate degree or current enrollment in a graduate degree program or permission of instructor.

### **MICR 808. Immunology. 3 Credits.**

Molecular and cellular aspects of immunity. Specific topics will include immunoglobulin and receptor structure/function, attributes of antigenicity, antigen-antibody reactions, immunocompetent cells, cellular interactions, soluble mediators of immune responses and normal and abnormal immune regulation. Prerequisite: Permission of course director.

### **MICR 809. Tumor Immunology. 3 Credits.**

Immune system and tumor growth; tumor immunotherapy. Analysis and applications of experimental systems and discussion of contemporary as well as classical primary literature in the field. Collaborative learning and communication skills emphasized. Prerequisite: IGPBS core curriculum or equivalent, or permission of instructor.

### **MICR 810. Fundamentals of Immunology. 2 Credits.**

Immune cells and soluble mediators of the innate and adaptive systems, antigen and pattern recognition, lymphocyte development and activation, immune effector mechanisms, mechanisms of immune-based diseases. Analysis and applications of experimental systems and discussion of contemporary as well as classical primary literature in the field. Collaborative learning and communication skills emphasized. Prerequisite: Introductory course work in cell and molecular biology; biochemistry and genetics.

### **MICR 811. Molecular Genetics of Bacteria and Phages. 2 Credits.**

This 2-credit course is designed for students pursuing a graduate degree in a biomedical field. The goal of the course is to introduce the fundamental concepts of modern microbial genetics and to expose the students to commonly used experimental procedures in microbial and molecular genetics. Students will study both textbook and literature sources and will learn to apply research methods to understand the problems associated with the bacterial physiology and genetics. Active learning approaches in the classroom will require that students work collaboratively with others. Both written and oral communication will be emphasized as important learning outcomes in this course. Prerequisite: An introductory course in biology, genetics, chemistry or biochemistry.

### **MICR 812. Molecular Virology and Pathogenesis. 2 Credits.**

This Virology course is aimed at graduate students who are pursuing a graduate degree in a biomedical field. It provides a contemporary understanding of how viruses are built, how they infect and replicate in host cells, how they spread and evolve, how they interact with host cells, how they eventually cause diseases, and how infection of a host can be prevented. Prerequisite: Introductory course work in cell and molecular biology, biochemistry and genetics.

### **MICR 820. Bacterial Genetics and Pathogenesis. 3 Credits.**

Genetics of bacteria with emphasis on bacterial pathogens. Topics include: gene regulation, recombination, bacteriophages, transposons, genetic exchange, plasmids, genetics of virulence, bacterial adherence and colonization, immune evasion mechanisms, bacterial toxins, vaccines and antimicrobials, re-emerging bacterial diseases. Prerequisite: Introductory course work in cell and molecular biology, biochemistry and genetics or permission of instructor.

### **MICR 825. Virology. 3 Credits.**

Virology (MICR 825) is a 3-credit advanced course for grad students. Its goal is to bring students' training in virology to more sophisticated level. The students will critically review published in peer-reviewed journals original research on important topics of modern virology (by evaluating study's rationale and significance; analyzing the advantages

and limitations of approach, and examining the data versus interpretations offered). An important part is a participation in the class, which includes: being familiar with the papers, and ability to generate questions and to support discussion of the material. Another integral part of the course is to become familiar with the research conducted by virologists on KUMC campus. For this purpose, the virologists of the Department of Microbiology, Molecular Genetics and Immunology will give a presentation describing the research conducted in their labs, and also will discuss with the students a manuscript on the topic from their research field. For the midterm exam, the students will present a manuscript of choice, including a critical analysis of the paper and leading the discussion of the paper. For the final exam, the students will write a grant proposal (in BRTP format), and will defend it at the presentation during the exam. The specific topics of the course include, but are not limited to mechanisms of viral replication and infection, antivirals, and host response. Prerequisite: Two Fundamentals Courses (MICR 810-812) or permission of course director.

**MICR 826. Oncogenesis Associated with Viral Infections. 3 Credits.**

The course is designed primarily for students pursuing a graduate degree in a biomedical field. The course will evaluate current understanding of the various mechanisms that mediate carcinogenesis that is linked to viral infections. It will also consider strategies of circumventing virus infections as a potential way of preventing the development of tumors. Prerequisites: Course MICR 812 or permission of instructor.

**MICR 830. Seminar in Microbiology. 1 Credits.**

Reports on research and literature.

**MICR 835. Research in Microbiology. 1-6 Credits.**

This course is specifically designed to provide supervised research experience in various laboratories in the department.

**MICR 855. Host-Pathogen Interactions. 3 Credits.**

Concepts of host-pathogen interactions, with an emphasis on how pathogens interact with the innate immune system. Course is primary literature-based with a body system organized approach covering niche-specific immune factors and how pathogens circumvent these systems. Prerequisite: MICR 810 and one of two Fundamentals Courses (MICR 811 or 812) or permission of course director.

**MICR 890. Master's Research in Microbiology. 1-10 Credits.**

This course is designated for research leading to the master's degree.

**MICR 899. Master's Thesis in Microbiology. 1-10 Credits.**

This course is designated for thesis writing leading to a master's degree in Microbiology.

**MICR 930. Advanced Topics in Microbiology. 1-8 Credits.**

An advanced approach to selected topics in any of the major disciplines in microbiology. Readings and conferences, or advanced laboratory techniques.

**MICR 990. Research for Ph.D. in Microbiology. 1-10 Credits.**

This course is restricted entirely to dissertation research.

**MICR 999. Dissertation for Ph.D. in Microbiology. 1-10 Credits.**

Restricted to actual writing of dissertation.