

required to take a Keystone course in the pathobiology of cancer as an additional requirement for the course. 3 credit hours. Prerequisite: Consent of the instructor.

SELECTED TOPICS IN MOLECULAR VIROLOGY GENE THERAPY AND TRANSGENICS. Cross-listed in Microbiology and Immunology

MECHANISMS OF CANCER THERAPEUTICS. Cross-listed in Pharmacology

CANB 344. INTEGRATED BIOLOGY OF CANCER (VUMC) (SPRING)

BICH 769. MOLECULAR BIOIMAGING (VUMC) (SPRING)

SPECIAL PROGRAMMATIC FEATURES OF THE GRADAUTE PROGRAM IN CANCER BIOLOGY

Cancer Biology Retreat. Preceptors and trainees in the Cancer Biology program participate in the annual Cancer Biology Retreat hosted jointly by Meharry Medical College and the Vanderbilt Ingram Cancer Center. This is an outstanding opportunity to learn of advances in cancer research from bench to bedside to behavioral research and community-based research. Participants also have the opportunity to obtain constructive feedback from a broad audience on each individual's research program.

Graduate Program in Microbiology and Immunology

COURSE REQUIREMENTS FOR THE PROGRAM in MICROBIOLOGY AND IMMUNOLOGY

DR: Departmental Required Course

DE: Departmental Elective Course

First Year: Core Curriculum

Second Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Foundations in Research (DR)	3
	Fundamentals in Immunology (DR)	2
	Seminal Papers on the Foundations of Modern Microbiology (DR)	2
	Seminars/Journal Club (DR)	1
	Dissertation Research(DR)	1-12
	General Electives (DE)	
Spring Semester		
	Roles of Microorganisms in the	2

	Living World (DR)	
	Host-Pathogen Relationships (DR)	5
	Seminars/ Journal Club (DR)	1
	Dissertation Research (DR)	1-12
	General Electives (DE)	
Summer Semester		
	Research (DR)	6

Third Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Research (DR)	1-12
	Preparation of PhD Candidacy Proposal Seminar	1
Spring Semester		
	Research	1-12
	PhD Candidacy Exam Seminar / Journal Club (DR)	1
Summer Semester		
	Research (DR)	6
	PhD Candidacy Exam	

Subsequent Years:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Research (DR)	1-12
	Seminar/ Journal Club (DR)	1
Spring Semester		
	Research (DR)	1-12
	Seminar / Journal Club (DR)	1
Summer Semester		
	Research (DR)	6

Students are expected to complete the requirements for the Ph.D. degree in 5-6 years.

Elective Courses Taught at Meharry Medical College

- Perspectives in Immunology (MICR 702)
- Gene Transcription and Regulation (BSCI 719)
- Directed Studies (BSCI 736)

Advanced Seminar and Special Topics (MICR 901)
Advanced Virology (MICR 713)

Elective Courses Taught at Vanderbilt

Cellular and Molecular Basis of Vascular Disease
Microbial Genetics
Molecular Virology
Cellular Microbiology of the Pathogen-Host Interaction
Human Genetics

COURSE DESCRIPTIONS FOR THE PROGRAM IN MICROBIOLOGY AND IMMUNOLOGY

MICR 702. PERSPECTIVES IN IMMUNOLOGY. This course consists of a series of seminars on recent research advances in immunology. Topics covered include immunochemistry, immunogenetics, cellular immunity, tumor and transplantation immunology, immunopathology and the complement system. Prerequisite: Medical Microbiology or equivalent preparation in immunology. 3 credit hours. SPRING, even years. Coordinator, Dr. M. F. Lima.

MICR 703. SEMINAL PAPERS ON THE FOUNDATIONS OF MODERN MICROBIOLOGY. Students present and discuss papers describing fundamental discoveries in areas related to microbiology. The goal is to familiarize students with the process of scientific discovery, and with the history of major developments in the field. Topics include important discoveries involving major human pathogens, fundamental processes in molecular biology, and the development of technology that has a major impact on current biomedical research. 2 credit hours. FALL every year. Coordinator, Dr. M. Chaudhuri.

MICR 708. FOUNDATIONS IN RESEARCH. The goal of this course is for the student to critically review the literature relevant to his/her proposed thesis research. The outcome of the course will be a student-prepared paper that provides a thoroughly documented background that supports the rationale for the proposed research project. The choice of the research problem should be determined by the student in consultation with the preceptor. Each student will be guided by a committee of three faculty members that will include the student's preceptor. 3 credit hours. SPRING, every year. Coordinator, Dr. R. Holt.

MICR 709. HOST-PATHOGEN RELATIONSHIPS. The course is designed primarily for advanced graduate students. Instruction consists of lectures, informal discussions, and guest speakers. Emphasis is directed to examining the theoretical, molecular, ultrastructural and physiological elements which characterize hosts and parasites in the broad sense (bacteria, viruses and parasites). Prerequisites: MICR-710 or equivalent preparation in immunology. 5 credit hours. SPRING, odd years. Coordinator, Dr. M.F. Lima.

MICR 710. FUNDAMENTALS IN IMMUNOLOGY. This course reviews the basic concepts in immunology. It consists of the immunology lecture and laboratory component of Medical Microbiology and seminar/discussions focused on selected topics in immunology. This course may serve as a pre-

requisite for advanced immunology courses offered by the Department of Microbiology. 3 credit hours. SPRING, every year. Coordinator, Dr. M. F. Lima.

MICR 713. **Molecular Biology of Animal Viruses.** Lecture course with emphasis on mechanisms of viral replication, oncogenic transformation, and virus-host cell interactions. 3 credit hours. SPRING, alternate years. Coordinators, Drs. Waldemar Popoik and B. Liu.

MICR 714. **ROLE OF MICROORGANISMS IN THE LIVING WORLD.** A topical course exploring the biology of microorganisms. Emphasis on mechanisms underlying microbial adaptations and how they influence biological systems. 2 credit hours. SPRING, every year. Coordinator, Dr. Raju Ramasamy.

BSCI 719. **GENE TRANSCRIPTION AND REGULATION.** Structure and function of different RNA polymerases (RNAPs). Role of CTD (C-terminal domain) of RNAP II. Basic aspects of initiation of transcription by RNAP I, II and III. Molecular mechanisms of transcription activation. Regulation of basic transcription initiation, elongation and termination in bacterial system. Regulation of transcription initiation, elongation and termination in eukaryotic system. Chromatin and regulation of transcription. DNA topology and gene expression. Structural studies (X-ray crystallography and NMR) of transcription factors. Nucleic acid-protein interactions. Regulation of expression of tumor suppressor genes and human tumor virus genes. Methods involved in transcription research. 3 credit hours. SPRING, even years. Coordinator, Dr. G. Chaudhuri.

BSCI 736. **READINGS IN BIOMEDICAL SCIENCES (Directed Studies).** Intensive reading under the guidance of a faculty member in an area selected by the student. The student and faculty member meet weekly to discuss the readings; the student may be required to write a paper on the semester's reading. 1-3 credits. FALL and SPRING, every year. Faculty.

MICR 850. **MICROBIOLOGY RESEARCH.** Ph.D. Dissertation Research. Required of students who are candidates for the doctoral degree. 1-12 credit hours. FALL and SPRING, every year. Faculty.

MICR 900. **MICROBIOLOGY SEMINAR.** Weekly discussion of current topics in microbiological research and of research within the department. 0-1 credit hour. FALL and SPRING, every year.

MICR 901. **ADVANCED SEMINAR AND SPECIAL TOPICS.** This course is a discussion by advanced graduate students and a faculty discussion leader who will make assignments from the current literature on a specific subspecialty. The course will examine experimental design, laboratory techniques used, validity of conclusions and contributions to the knowledge of the field under consideration. 1-3 credit hours. FALL and SPRING, every year.

Courses taught at Vanderbilt University that are permitted as electives in this program

Cellular and Molecular Pathology 337. **CELLULAR AND MOLECULAR BASIS OF VASCULAR DISEASE.** Lectures on contemporary research in cell biology, protein and lipid biochemistry, and molecular biology of the vascular system. 3 credit hours. SPRING

Microbiology and Immunology 328 1. **MICROBIAL GENETICS.** The genetics of bacteria and yeast and their use in molecular biology as an experimental tool. 2 credit hours. FALL.

Microbiology and Immunology 328 2. MOLECULAR VIROLOGY.. The interaction of animal viruses with their host cells, discussed at the molecular and cellular level as model systems. Special emphasis on current literature and methodology. 3 credit hours. FALL.

Microbiology and Immunology 350. CELLULAR MICROBIOLOGY OF THE PATHOGEN-HOST INTERACTION. An interdisciplinary course designed to train students in the field of molecular microbiology and/or cell biology. Model organisms or their products will be analyzed in the context of molecular cell microbiology. Students will be challenged to utilize new information from microbial genome sequencing to understand host cell Subcellular compartments and signaling pathways. 3 credit hours. SPRING.

Molecular Physiology and Biophysics 340. HUMAN GENETICS. Designed to cover background and latest advances in human genetics. Topics will include an overview of mutational mechanisms, cytogenetics (detection and description of chromosomal abnormalities), biochemical genetics (gene defects in biochemical pathways), molecular genetics (gene structure, function, and expression), population genetics (heritability, quantitative traits, variance analysis), gene mapping (positional cloning, statistical and molecular techniques), and genetic epidemiology (genetic linkage analysis, design of gene mapping studies, gene-environment interaction). Topics will be discussed with reference to specific human genetic diseases. 3 credit hours. SPRING.

SPECIAL PROGRAMMATIC FEATURES OF THE GRADAUTE PROGRAM IN MICROBIOLOGY AND IMMUNOLOGY

Microbiology Retreat. The Microbiology Retreat is a weekday program of informal research talks and discussions. Faculty, students and fellows attend this function. This Retreat provides an outstanding opportunity to keep up to date with the diverse research underway in the program and to participate in vigorous scientific discussions. Students are expected to attend the Retreat, and are encouraged to present their research either as a formal talk or a poster.

Graduate Program in Neuroscience

Course Requirements for the Program in Neuroscience

DR: Departmental Required Course

DE: Departmental Elective Course

First Year: Core Curriculum

Second Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Graduate Neuroscience (DR)	5
	Neuropharmacology (DR)	3