

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

	Research in Physiology (DR)	1-12
	Seminar in Physiology (DR)	1
Spring Semester		
	Toxicology (DE)	3
	Neurobiology of Disease (DE)	1-5
	Research in Physiology (DR)	1-12
	Seminar in Physiology (DR)	1
Summer Semester		
	Research in Physiology (DR)	6

Third Year:

Semester	Name of Course	Number of Credit Hours
Fall Semester		
	Advanced Neurophysiology (DE)	3
	Neurobiology of Disease (DE)	1-5
	Research in Physiology (DR)	1-12
	Seminar in Physiology (DR)	1
	Preparation of PhD Candidacy Proposal	
Spring Semester	General Electives	
	Research in Physiology (DR)	1-12
	Seminar	1
	PhD Candidacy Exam	
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	1
Spring Semester		
	Research (Dissertation Research)	1-12 (1-3)
	Seminar	1
Summer Semester		
	Research (DR)	6

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

Neuroscience Electives

(a) Meharry Medical College

NSC1 70001 Neurobiology of Disease (1-5 credits)

PHAR 723 Toxicology (3 credits)

PHY720 Readings in Physiology (3 credits)

(b) Vanderbilt Courses

NURO 325 (MMC: PHYS 724) Neuroscience Foundations (2 credit)

NURO 345 (MMC: 73701) Cellular and Molecular Neuroscience (4 credits)

NURO 340 (MMC: PHYS 70901) Systems Neuroscience (4 credits)

COURSE DESCRIPTIONS FOR THE PROGRAM IN NEUROSCIENCE

NSC1 700. NEUROBIOLOGY OF DISEASE. The course has five modules (1 credit hour each). Five modules are: Parkinson's Disease and Movement Disorders; Alzheimer's Disease and Dementias; Chronic Pain; Addictions; Depression and Mood Disorders. The importance of this course, and the rationale for its development, is to foster preparedness for interdependent collaborative research that spans from bench to bedside, and also allows laboratory investigators to exploit clinical insights to inform basic science inquiries. The goal is to train scholars for participation in interdependent research across the molecular and cellular to integrative and clinical continuum. The course will foster this interdependence by both the content of the courses as well as the participation in these courses by graduate, medical, postgraduate (MD and PhD) fellows. The selection of the disease themes of this course reflect areas of research interest and strength at both Meharry and Vanderbilt, and also- in their didactic content- will allow students to become familiar with the breadth of experimental strategies and areas of scholarship (including genetics and imaging, for example) that converge to facilitate discovery to translation to clinical diagnosis and intervention. Prerequisite: Graduate Neuroscience. 1-5 credits. Fall & Spring.

PHYS 709. ADVANCED NEUROPHYSIOLOGY. A functional approach to nervous system mechanisms. Topics include sensory and motor mechanisms, sensory motor integration and higher functions.

The course will include lectures, selected literature discussions and essay examinations. 3 credits. Prerequisite: Human Physiology. (Substitute for Systems Neuroscience)

PHYS 712. SEMINAR IN PHYSIOLOGY. Weekly discussion of current topics in neuroscience research and of research within the Department of Neuroscience and Pharmacology.

PHYS 714. RESEARCH IN PHYSIOLOGY. Participation and credit in this course are arranged by the COI of students working on their PhD thesis research. Required of all students who are candidates for the doctoral degree.

PHYS 721. DISSERTATION RESEARCH. This is a practical course in assembling, analyzing, and presenting large quantities of experimental data. Students are required to register for this course in their last semester of residence. Course is completed with the approval of the written dissertation by the COI. PhD thesis research. Required of all students who are candidates for the doctoral degree.

PHYS 724. NEURONAL PHYSIOLOGY. Advanced study of cellular processes related to nervous system functions will include aspects of neurophysiology, neurochemistry and neuroanatomy. Format will be primarily lectures and selected literature readings. Prerequisite: core curriculum. 3 credit hours
(Substitute for NURO 325. Neuroscience Foundations- 2 credit hours)

PHYS 735. GRADUATE NEUROSCIENCE. The goal of this course is to help students achieve an integrated and correlated understanding of nervous system structure, function, dysfunction and therapeutics. The course covers the following major topics: 1) excitable cells and synapses; 2) anatomy of the nervous system, meninges and neuron-vasculature; 3) sensory systems; 4) motor system; and 5) higher functions. Graduate student exams in this course are essay type, and test critical thinking skills. (Drs. Ansah, Mokha and Staff).

PHARM 722. NEUROPHARMACOLOGY. This course presents an overview of neuropharmacology, including fundamentals of receptor theory, Neurotoxicology, neurophysiology and drug abuse. Mechanisms and problems concerned with neurotransmission will be discussed. Emphasis is given to the neurochemical basis of CNS disorders and drug intervention. Lecturers, current literature, discussions are included. 3 credit hours (Dr. Charlton & Staff)

PHARM 723. TOXICOLOGY. Principles involved in toxicity of drug and chemical agents will be presented. Topics include xenobiotic biotransformation, toxicokinetics, chemical carcinogenesis, neurotoxicology, metal toxicity, toxic response of skin & respiratory system & occupational toxicology. Toxicological mechanisms of action, rationale for therapeutic measures against effects of toxic chemical agents, and the basis for toxicological pathology, Current issues in toxicology (Toxicogenomics) will also be covered. Course format includes lectures, and student involvement in critical review of current literature. 3 credit hours (Dr. Hood & Staff)

PHYS720. Readings in Physiology. Student should complete a comprehensive reading list of topics specifically associated with his/her area of research. There will be no formal meetings or exam. This course may be taken only once for credit. 3 credit hours

Courses at Vanderbilt that may be taken as Electives in the Neuroscience emphasis program

NURO 325. NEUROSCIENCE FOUNDATIONS. This course discusses historical concepts and individuals in neuroscience, so that students develop an appreciation for the history of their discipline.

FUNDAMENTAL NEUROSCIENCE. This comprehensive course covers the fundamentals of the nervous system, from molecules to networks and systems. The lectures are designed to move from the pioneering work that established a research area to the recent advances in neuroscience. In addition to the didactic content of this course, the intent is to foster the discovery paradigm-breaking thinking that parallels major advances in a field.

NURO 340. Systems Neuroscience (description pending)

(NURO 345.) PHAR 345. CELLULAR AND MOLECULAR NEUROSCIENCE. An overview of major neural networks, including examples from motor and sensory systems, as well as higher cognitive and affective functions. Studies of neural development move from an examination of neurogenesis, cell fate, and phenotype development to an analysis of invertebrate models and how they have advanced our understanding of mechanisms involved in axonal guidance, synapse formation and apoptosis. Additional lectures covering synaptic and systems plasticity, and models of neural networks and learning and memory will also be provided. Emphasis is placed on the integration of anatomical, biochemical and physiological information. (Blakely)

(NURO 346.) PHAR 346. MOLECULAR NEUROBIOLOGY. Molecular components and interactions that regulate neuronal development, signaling and disease. Classic molecular analysis of neurobiological processes will be coupled with detailed studies of contemporary literature to provide students with a sound foundation for understanding the molecular bases underlying the development and function of the nervous system. Topics to be covered include: development of neuronal identity, axonal transport, growth factors and cell death, axon guidance and synapse formation, electrical and chemical neurotransmission, regulation of neuronal excitability, and genetic analysis of signaling and neural disorders. (Emeson)

SPECIAL PROGRAMMATIC FEATURES of the Neuroscience Graduate Program

Neuroscience Retreat. In order to enhance the cohesiveness and visibility of the neuroscience program, a one-day Meharry-Vanderbilt Neuroscience Retreat is organized to focus on an emerging area of neuroscience. The central theme is developed by three to four faculty research presentations that move from molecules to neural systems to behavior or disease. A nationally recognized neuroscientist is invited to present a plenary lecture that relates to the central theme. The one-day program includes poster presentations by graduate students (second year and beyond) in the program, thus giving students an opportunity to get constructive input about their ongoing projects from the visiting as well as local scientists outside the program. Thus, the Spring Retreat serves as a venue for highlighting students in our program and providing valuable contacts for future career opportunities. In addition to the educational benefits, this experience will serve as a confidence builder for the students and provide time for informal scientific and social interactions. An added benefit of the Retreat is that advice is sought from the invited speaker on improvements in our training program.

The Neuroscience Student Organization (NSO). This was established by graduate students in 1998, and membership includes any interested graduate student doing neuroscience-related work in any department or program at Meharry or Vanderbilt. The NSO is run by students and has its own infrastructure, including a President and advisory council. The NSO organizes a biweekly Summer Seminar Series to which only students are invited. Individual students make research presentations providing an opportunity for them to discuss their research in a relaxed environment and get input from students of diverse backgrounds and interests. The NSO also coordinates an annual Spring Neuroscience Seminar with students selecting the topic and speaker, making travel and itinerary arrangements, and setting up and advertising the seminar. One of the goals of the Spring Neuroscience Seminar is to allow trainees to develop a professional network in the at-large community that will serve as a foundation for future professional endeavors. Finally, the NSO is instrumental in helping coordinate aspects of the annual Neuroscience Retreat and Brainstorm Brain Awareness Program, making this organization a dynamic and enriching component of the Neuroscience Graduate Program.