

MPHY - MEDICAL PHYSIOLOGY

MPHY 601 Experimental Techniques in Cell and Molecular Biology I

Credits 4. 2 Lecture Hours. 4 Lab Hours. Lectures, demonstrations and hands-on laboratories focusing on both basic and advanced techniques utilized in modern biomedical research: optical, fluorescence, confocal/multiphoton, TIRF, and atomic force microscopic techniques; calcium imaging; patch-clamp; cell culture and transfection; DNA/RNA preparation; molecular cloning; RT-PCR; RNAi; protein biochemistry; Southern/northern/western blotting.

MPHY 603 Applied Microscopy for Biomedical Research

Credit 1. 1 Other Hour. Exploration of imaging techniques utilized in biomedical research; basic theory of optical microscopy concepts; microscopy techniques presented with emphasis on information gained from a technique as well as advantages and disadvantages, ie, limitations, of techniques; focus on designing experiments and understanding application of different microscopy techniques to biomedical research. **Prerequisite:** Graduate classification and approval of course director.

MPHY 612 Experimental Techniques in Cell and Molecular Biology II

Credits 2 to 4. 2 to 4 Lab Hours. This course is designed as a hands-on laboratory course to introduce the beginning graduate student to a variety of quantitative, analytical, cellular, histological, as well as ex vivo and in vivo techniques utilized in biomedical research. Information is relayed through lectures, demonstrations, and hands-on experience with the techniques discussed. The objective of this course is to help the student gain some laboratory experience and, at the same time, become familiar with basic protocols for biomedical techniques utilized in biological research. **Prerequisite:** Graduate classification and approval of course coordinator.

MPHY 613 Medical Physiology I

Credits 1 to 5. 1 to 5 Lecture Hours. This course is a comprehensive survey of the functions of the human body: transport processes, feedback control systems and homeostasis; general structure and function of the central nervous system, electrophysiology, autonomic nervous system; musculoskeletal system; and cardiovascular system. Format includes lectures, labs, field trips, and student projects/presentations. The overall goal is for students to understand, integrate, and appreciate the numerous and complex interactions between the components of the intact system. **Prerequisite:** MSCI 601 or equivalent.

MPHY 614 Medical Physiology II

Credits 1 to 5. 1 to 5 Lecture Hours. This course is a continuation of MPHY 613. Students will study Neurophysiology II; gastrointestinal system; respiratory system; renal/excretory system; endocrine and reproductive systems; integration of human organ systems. **Prerequisite:** MPHY 613 or equivalent.

MPHY 615 Pathobiology and Therapeutics

Credits 4. 4 Lecture Hours. This course is designed to help students develop the ability to learn by themselves, with the oversight of a group of faculty mentors. Each student will choose a disease model system from a chosen list of diseases/model systems that affect multiple systems of the body. Students will collect and present information on how their chosen disease or integrative model system affects various organ systems. Students will put together an integrative proposal to present to the class, followed by a final written proposal. **Prerequisite:** MPHY 613 and MPHY 614 or equivalent.

MPHY 616 Computational Systems Biology

Credits 4. 4 Lecture Hours. This course is designed as the first of a two-semester, multi-disciplinary graduate course targeted at students with an interest in computational aspects of systems biology. The course will be constructed in a modular fashion, such that either semester may be taken independently. MPHY 616 is an introduction to methods used to acquire, extract, organize, analyze, store and interpret the major types of data of interest in systems biology. It will consist of two main units: (1) exploration, analysis and interpretation of experimental data and (2) bioinformatics.

MPHY 617 Nervous System I/ Musculoskeletal System

Credits 2. 2 Lecture Hours. This course is a separate module within the course MPHY 613.

MPHY 618 Cardiovascular System

Credits 3. 3 Lecture Hours. This course is a separate module within the course MPHY 613.

MPHY 619 Nervous System II

Credit 1. 1 Lecture Hour. This course is a separate module within the course MPHY 614.

MPHY 620 Gastrointestinal System

Credit 1. 1 Lecture Hour. This course is a separate module within the course MPHY 614.

MPHY 621 Excretory System

Credit 1. 1 Lecture Hour. This course is a separate module within the course MPHY 614.

MPHY 622 Endocrine System

Credit 1. 1 Lecture Hour. This course is a separate module within the course MPHY 614.

MPHY 623 Respiratory System

Credit 1. 1 Lecture Hour. This course is a separate module within the course MPHY 614.

MPHY 624 Biostatistics

Credits 2. 2 Lecture Hours. Introduction to methods used to acquire, extract, organize, analyze, store and interpret the major types of data of interest in systems biology.

MPHY 625 Bioinformatics

Credits 2. 2 Lecture Hours. Introduction to methods used to acquire, extract, organize, analyze, store and interpret the major types of data of interest in systems biology.

MPHY 631 Cardiovascular and Lymphatic Biology

Credits 4. 4 Lecture Hours. Advanced multidisciplinary analysis of the cardiovascular and lymphatic system that incorporates molecular and cell biology, anatomy, physiology and pharmacology; basic concepts include transport processes, feedback control and homeostasis; vascular biology includes endothelium, smooth muscle, capillary exchange, blood flow regulation, vasculogenesis, angiogenesis; lymphatic biology includes lymphangiogenesis, lymphatic system and lymph transport; cardiac biology includes myocytes, conduction tissue, myofilament activation and deactivation, myocardial contractility, electrical coordination of cardiac pumping, cardiac cycle, cardiac output and its regulation; cardiovascular integration includes intrinsic, neural and hormonal mechanisms, regulation of arterial pressure, cardiovascular responses to exercise, hemorrhage, inflammation and metabolic disorders.

Prerequisites: MSCI 601 or equivalent.

MPHY 632 Cardiovascular and Lymphatic Pathobiology

Credits 4. 4 Lecture Hours. Exploration of the pathophysiology underlying cardiovascular and lymphatic diseases, including atherosclerosis, cardiomyopathies, heart failure, hypertension, obesity, congenital abnormalities and valvular disorders; conceptual foundation is the tissue response to injury (inflammation) and the integrated reactions at the cellular, organ, system and whole organism levels initiated by a specific insult or disorder; presentation and critique of journal articles in the cardiovascular and lymphatic fields as well as development of research proposals. **Prerequisite:** MPHY 631 or equivalent.

MPHY 633 Advanced Techniques in Cardiovascular and Lymphatic Research

Credits 1 to 4. 1 to 4 Other Hours. Specific techniques used in modern cardiovascular and lymphatic research under the guidance of a faculty expert; topics span intact animal to single cell techniques; includes animal models of human disease, advanced physiological imaging, mouse echocardiography, mouse intact papillary muscle, isolated microvessels/lymphatics, in situ evaluation of lymphatic/microvascular function, pressure/tension myography, primary lymphatic endothelial cell isolation/culture, and patch clamping. **Prerequisites:** Approval of course coordinator.

MPHY 634 The Lymphatic System

Credits 3. 3 Lecture Hours. This course explores the myriad functions of the second circulation of the human body, the lymphatic system. Topics covered include lymphatic development; lymphangiogenesis; morphology and function of lymphatic capillaries, muscular lymphatics and lymph nodes; mechanisms of lymph formation and propulsion; intrinsic and extrinsic mechanisms of lymphatic pumping and flow regulation; role of the lymphatic system in inflammation and immunity; primary and secondary lymphatic disorders. Emphasis is on critique of the literature and self-directed integration of concepts and data into a research proposal.

MPHY 635 Lymphatics - Regulation of Immunology and Inflammation

Credits 3. 3 Lecture Hours. Integration of lymphatic vessel biology and the immune response in understanding local tissue pathophysiology; roles that lymphatic vessels play, or may play, in acute injury and chronic inflammation, including pathogenic infection, cardiovascular disease, cancer progression and neuroinflammation; established and emerging mechanisms by which the lymphatic network and lymphatic endothelium modulate immune cell responses, emphasis on recent literature. **Prerequisite:** Graduate classification and approval of Course Director prior to registration; MPHY 634 recommended.

MPHY 681 Seminar

Credit 1. 1 Lecture Hour. Focus will be on critical scientific thinking. Emphasis placed on oral communications, scientific writing and grant preparation. **Prerequisite:** Approval of instructor.

MPHY 685 Directed Studies

Credits 1 to 6. 1 to 6 Lecture Hours. Limited investigation in fields other than those chosen for thesis or dissertation. **Prerequisite:** Approval of instructor.

MPHY 689 Special Topics

Credits 1 to 4. 1 to 4 Lecture Hours. Selected topics in an identified area of physiology and associated basic sciences. May be repeated for credit when topics vary. **Prerequisite:** Approval of instructor.

MPHY 691 Research Credit

Credits 1 to 15. 1 to 15 Lab Hours. .