Medical Science (MEDS)

health.uconn.edu/graduate-school

5308. The Nature of Evidence in Scientific Research

Two credits.

Aspects of the scientific process that are common to all levels of biomedical investigations: from biophysics in cell-free systems to molecular biology in cells, to physiology in whole organisms, to epidemiology and clinical investigation in humans. These features begin with enunciation of the question to be asked, and include (1) Identification of a system to address the question, (2) Specification of the systems and their manipulation, (3) Assessment of outcomes, and (4) Drawing inferences on the basis of results. Discussion of seminal, published works on the topics. Two to three key papers will be distributed to participants at least one week before the scheduled discussions. There will be no examination for the course. Students are expected to actively participate in critical evaluation and discussion during each of the weekly two-hour sessions. Evaluation of performances will be based solely on such participation.

5309. Molecular Basis of Disease

Two credits.

Seminar and discussion based course that reviews the molecular understanding of human disease.

5310. Responsible Conduct in Research

One credit. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Introduction to ethical and legal issues associated with the practice and reporting of science. Uses a case study approach and requires in-class student participation.

5313. Biomaterials and Tissue Engineering

(Also offered as BME 5700 and MSE 5700.) Three credits. Prerequisite: Instructor consent. Recommended preparation: BME 3700.

A broad introduction to the field of biomaterials and tissue engineering. Presents basic principles of biological, medical, and material science as applied to implantable medical devices, drug delivery systems and artificial organs.

5322. Developmental Biology

Two credits.

History, concepts, and experimental strategies in both classical and modern developmental biology. Topics ranging from early fertilization, to early embryonic development, to the formation of adult structures are considered and compared in a range of model organisms. One hour of lecture by instructors and one hour of literature analysis and discussion by students each week. Course grade will combine results of class participation and a final exam.

5323. Genetics and Developmental Biology Journal Club

One credit. May be repeated for a total of 10 credits.

Reading and discussion of current research in the fields of genetics and developmental biology with emphasis on molecular aspects. Periodic presentation of research papers and active discussion will be expected of all participants.

5325. Computational Genomics Practicum

Two credits. Prerequisite: Instructor consent.

A practical introduction to computational genomics focusing on methods for processing/analyzing Next Generation Sequencing (NGS) data. 1. Programming: Introduction to the Linux command line, elements of Python and R programming. 2. Genomics software tools for performing sequence read-alignments, transcript-expression profiling, and robust procedures for gauging differential gene expression. 3. Methods for genome assembly, genome variation detection, motif finding, and data-visualization. 4. Statistical topics include probability distributions, central limit theorem, hypothesis testing, linear models, and dimensionality reduction.

5327. The Logic of Modern Biology

Four credits.

Fundamental biochemical and genetic principles that underlie all areas of modern biology. The biochemistry and genetics of both prokaryotes and eukaryotes are addressed. Reading and discussion of papers in the literature are important elements of the course.

5329. Immunobiology

Four credits.

This course will first introduce the basic components that comprise the immune system, and then explore how the immune system impacts health and disease.5335. Advanced Molecular and Cellular Immunology I

Four credits. Prerequisite: Instructor consent.

Major areas covered include: (1) Development of the immune system with respect to lymphoid organs and lymphocyte subsets; (2) Mechanisms of antigen processing and presentation; (3) Lymphocyte activation including the role of costimulatory molecules and (4) Regulation of the immune response including tolerance induction, cytokine interactions and signal transduction.

5341. Molecular Neurobiology of Excitable Membranes

Three credits. Prerequisite: Instructor consent.

Emphasizes the relation between structure and function of biological interfaces that comprise electrically excitable and chemically excitable (synaptic) membranes. Models of electrically and chemically induced regulation of ion movement via channels and transporters are examined. Genetic manipulation of channel composition is evaluated with attention to altered function and inferences about their structure.

5351. Biochemistry II

Three credits.

Fundamentals of biomolecular interactions and protein structure. Structure/function of select proteins and enzymes essential to the following: metabolic pathways, DNA/RNA transactions, gene expression, cell cycle and signal transduction, and the cytoskeleton.

5369. Advanced Genetics and Molecular Biology

Three credits.

An advanced course emphasizing approaches to the genetic analysis of eukaryotic systems including yeast, fungi, Drosophila, mice, and humans. Topics include genome organization, DNA replication, regulation of gene expression, development, and differentiation.

5371. Systems Neuroscience

Three credits. Prerequisite: Instructor consent.

Part of the core series in the Neuroscience graduate program. Functional organization of neural systems underlying sensation, movement, language, learning/plasticity, and emotion/arousal. Sensory systems will include the somatosensory, auditory, visual, vestibular, and chemosensory systems. Motor systems will include the spinal cord, brain stem, cerebellum, vestibular system, oculometer system, basal ganglia and cerebral cortex.

5372. Neuroscience: Cellular and Molecular Neuroscience

Three credits. Prerequisite: Instructor consent.

Part of a core series in the Neuroscience Program, this course provides an introduction to basic concepts in the study of cell biology, neuroanatomy, neurophysiology, neurochemistry, and molecular biology of the nervous system.

5375. Neuroscience: Current Research Topics/Methods

One credit. Prerequisite: Instructor consent. May be repeated for a total of four credits.

Familiarizes students early in their education (first or second year) with various key methodologies to which they will be exposed in courses, journal club presentations, and seminars. After a brief overview of basic concepts, applications, controls, and permutations of the method in the classroom, students will observe and participate in a demonstration of important technical aspects of the method in the laboratory setting. Targeted toward students with an interest in neuroscience or neuroimmunology.

5377. Neurobiology of Hearing

Three credits. Prerequisite: Instructor consent.

Provides in-depth analysis (using the Auditory System as a model system) with application of interdisciplinary approaches of cell and molecular biology, developmental neurobiology, neuroanatomy, neurophysiology/biophysics, neurochemistry, neural modeling, psychophysics, and plasticity, with state-of-the-art methods used in neuroscience research today. The team of faculty members contribute a variety of complementary fields of study.

5378. Computational Neuroscience

Three credits. Prerequisite: Instructor consent.

Students study the function of single neurons and neural systems by the use of simulations on a computer. Combines lectures and classroom discussions with conducting computer simulations. The simulations will include exercises and a term project. Each student will complete a term project of neural simulation to be developed during the second half of the semester. The topic of the term project should be approved by the instructors by the middle of the semester. The grade will be based on the exercises and the term project. Course includes: analysis of electrical circuits modeling neuronal cell membrane and the related differential equations; the Hodgkin-Huxley model of voltage- and time-dependent sodium and potassium conductances in the squid axon; voltage-clamp and current-clamp; the relationship between two rate constants versus the steady-state value and time constant underlying each conductance; neuronal response properties that are related to voltage-dependent and calcium-dependent ion channels; single- and multi-compartment models with ionic conductances simulating specific neuronal response properties described in the literature; excitatory and inhibitory postsynaptic currents and underlying ligand-gated ion channels; dendritic electrotonus and synaptic integration; temporal and spatial interactions of synaptic inputs to the dendritic tree and the cell body; action potential propagation in axons; neural circuits.

5380. Cell Biology

Four credits.

Basic eukaryotic cell biology. Major topics include Methods in Cell Biology; Cell Growth and Proliferation; Cytoskeleton; Transport: Hormone Response; Cytoplasmic Organelles and Membrane Structure, Function, Biogenesis, Transport and Sorting; Cell Motility; Chromatin Structure and Organization; and Extracellular Matrix and Cell Adhesion.

5382. Practical Microscopy and Modeling for Cell Biologists

Two credits.

Introduction to the students the most recent achievements in the field of intracellular signaling and regulation. Each of the participating faculty members will give an introductory lecture to provide an overview of signaling events in their field of expertise and discuss the most important recent papers.

5383. Neurobiology of Disease

Three credits.

Discussion and lecture run by clinician and basic scientist, on diseases of the nervous system.

5384. Brain Microcircuits

Two credits. Prerequisite: Instructor consent.

Brain microcircuitry is an upper level course.

5385. Molecular Mechanisms of Neurobiological Disorders

Three credits.

Discussion of current papers relevant to molecular analyses of neurobiological diseases.

5395. Independent Study

Variable (1-6) credits.

5415. Craniofacial and Oral Biology

Two credits. May be repeated for a total of four credits.

Combination lecture and literature discussion course with a focus on the on the underlying biochemical, molecular and genetic mechanisms involved in the pathogenesis of craniofacial and oral disorders, the identification of unsolved questions, and consideration of possible approaches to investigate these questions.

5418. Stem Cells and Regenerative Biology

Three credits. Prerequisite: MEDS 5322 or 5327 or 5380.

A literature-based course on the fundamental aspects of stem cells; their nature, origin, self-renewal and differentiation during embryogenesis and tissue regeneration. Taught by a team of experts. Grade based on mid-term tests, class participation and presentation.

6372. The Neurobiology of Glia

Two credits.

Detailed introduction and advanced, in-depth discussion on specific topics related to the cellular biology and pathobiology of glia. First part of the course will be didactic lectures covering each of the types of glia in the central and peripheral nervous systems. Second part of the course will provide focused paper discussions on the specific roles of glia in particular diseases of the nervous system that may change with time to stay current with recent publications and innovations in the field.

6400. Human Biology

Variable (1-9) credits.

Introduces the histology of the major types of tissues and cellular ultrastructure. Following this introductory material, the students will dissect the limbs, and study epithelia, connective tissue, and skin including the extracellular matrix and body fluid compartments. Muscle, bone, peripheral nerves, the neuromuscular junction, blood vessels, and other elements essential to understanding the function of the limbs. For all tissues considered, there will be an integrated presentation of structure, biochemistry, and physiology. Also, presents the general principles of biochemistry and molecular biology. Fundamental processes involved in cellular growth and division are included as well as an overview of metabolism and energy production. This is followed by consideration of cellular differentiation. Finally, there will be a survey of the general principles of immunology and the lymphoid tissues including the function of blood cells and coagulation.

6404. Correlated Medical Problem Solving - Part A

Two credits. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

This course serves to expand upon and integrate basic science concepts introduced in the Human Systems.

6405. Correlated Medical Problem Solving - Part B

Two credits. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Expands upon and integrates basic science concepts introduced in the Human Systems course.

6406. Human Development and Health

Variable (1-2) credits. May be repeated for a total of two credits. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

The HDH course has been taken by combined MD/PhD students for graduate school credit in the 2nd year of study. The School of Medicine has now divided the course so that parts are taken in the 1st and 2nd years. In fall 2013, current second year students will enroll for 2 credits while current first year students and all subsequent classes will enroll for 1 credit in each of the first two years.

6407. Mechanisms of Disease: Part A

Four credits. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

A 30-week, yearlong medical school course covering the pathology and pathophysiology of organ systems and basic principles of therapeutics. The instruction format includes about 50% lecture, 15% laboratory, 30% small group conference and 5% clinical-pathological correlations. The course covers General Pathology, Pharmacological Principles, and Infectious Disease; Diseases of Homeostasis; Oncology and Diseases of Metabolism; and Diseases of the Nervous System, Diseases of the Reproductive System and Immune and Non-immune Mediated Diseases.

6408. Mechanisms of Disease: Part B

Six credits. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

A 30-week, yearlong medical school course covering the pathology and pathophysiology of organ systems and basic principles of therapeutics. The instruction format includes about 50% lecture, 15% laboratory, 30% small group conference and 5% clinical-pathological correlations. The course covers General Pathology, Pharmacological Principles, and Infectious Disease; Diseases of Homeostasis; Oncology and Diseases of Metabolism; and Diseases of the Nervous System, Diseases of the Reproductive System and Immune and Non-immune Mediated Diseases.

6411. Clinical Practicum

12 credits. Prerequisite: Instructor consent. May be repeated for credit. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Clinical experience in the major disciplines including: Medicine, Surgery, Obstetrics and Gynecology, Psychiatry, Family Medicine, and Pediatrics.

6412. Advanced Clinical Practicum

11 credits. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Advanced clinical work with opportunities in the major clinical disciplines.

6413. Cancer Biology

Two credits.

This is a survey course to explore the genetics and pathobiology of cancer by focusing on a variety of current research topics. Understanding the disease process requires studying normal mechanisms of growth control. Emphasis will be on topics such as differentiation, apoptosis, growth factors, oncogenes, tumor suppressor genes, viruses and signal transduction.

6414. Advanced Correlated Medical Problem Solving - Part A

Two credits. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Expands upon and integrates basic science concepts introduced in Human Development and Health and Mechanisms of Disease.

6417. Advanced Correlated Medical Problem Solving - Part B

Two credits. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Expands upon and integrates basic science concepts introduced in Human Development and Health and Mechanisms of Disease.

6444. Medical Microbiology

Four credits.

Provides first and second year graduate students with a broad understanding of the molecular and medical aspects viruses and bacteria. For viruses, topics include entry, genome replication and gene expression, assembly, viral transformation, pathogenesis, host immune responses, clinical presentations viral immunology, treatment principles including vaccines and antiviral therapeutics, and emerging and re-emerging viruses that threaten human health. For bacteria, topics include development and differentiation, bacterial genetics and genomics, bacterial cell cycle (DNA replication, chromosome segregation and cell division), cell-cell communication, pathogenesis, host immune responses, clinical presentations and treatment principles. The course will include lecture, discussion of primary literature and student presentations. Grading will be based on class participation, student presentation and a short paper.

6445. Skeletal Biology

Two credits. Prerequisite: Instructor consent.

A comprehensive survey of the cellular and molecular mechanisms that regulate the development, growth, differentiation, remodeling, and repair of the skeletal system.

6447. Tool Kit for Scientific Communication

One credit. Prerequisite: Instructor consent. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

Through a series of lectures and workshops, designed to improve the ability of students to present scientific data in written and oral format. These skills are essential, not only as a graduate student, but in future careers as scientist. The curriculum covers basic elements and logical order of presentations. Reviewer's perspectives, grant writing resources, workshops, and evaluation of recent seminars help students to design and evaluate research projects.

6448. Foundations of Biomedical Science I

Four credits.

Encompasses topics considered fundamental to any student pursuing a Ph.D. in any Area of Concentration in the Biomedical Science Graduate Program. Combines an introduction to fundamental concepts along with a more in-depth analysis of the research that underlies some of these ideas. A variety of topics will be examined in approximately one-week modules that will include a basic, introductory one hour lecture on Mondays, a more in-depth discussion of one to two critical historical papers on an aspect of the topic on Wednesdays and then a small group discussion on a more modern paper related to the area on Fridays. Periodically, the course will include Consolidation weeks that discuss key methodologies in the context of new concepts or concepts previously discussed.

6449. Foundations of Biomedical Science II

Four credits.

Encompasses topics considered fundamental to any student pursuing a Ph.D. in any Area of Concentration in the Biomedical Science Graduate Program. Combines an introduction to fundamental concepts along with a more in-depth analysis of the research that underlies some of these ideas. A variety of topics will be examined in approximately one-week modules that will include a basic, introductory one hour lecture on Mondays, a more in-depth discussion of one to two critical historical papers on an aspect of the topic on Wednesdays and then a small group discussion on a more modern paper related to the area on Fridays. Periodically, the course will include Consolidation weeks that discuss key methodologies in the context of new concepts or concepts previously discussed.

6450. Optical Microscopy and Bio-imaging

(Also offered as BME 6450.) Three credits.

Presents the current state of the art of optical imaging techniques and their applications in biomedical research. The course materials cover both traditional microscopies (DIC, fluorescence etc.) that have been an integrated part of biologists' tool-box, as well as more advance topics, such as single-molecule imaging and laser tweezers. Four lab sessions are incorporated in the classes to help students to gain some hand-on experiences. Strong emphasis will be given on current research and experimental design.

6455. Introduction to Systems Biology

Three credits.

Guides students into a biology world as seen by engineers, physicists, mathematicians and computer scientists. Discussion of different kinds of predictive mathematical models and their dynamical behavior; stability, switching and stochasticity of a biological system; resources needed to start building a model; models exchange, simulation and visualization; public databases and software tools available for a modeler. Provides the necessary background to read modeling papers, choose Systems Biology resources that will help in biological projects, and be able to select a modeling technique appropriate for a given biological project.

6456. Human Systems A

Six credits. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

A 38-week long medical school course taken in the first year of the combined MD/PhD program. The course is divided into four sections: Human Biology, Organ Systems 1, Organ Systems 2 and Organ Systems 3. The course covers the basic elements of human anatomy, histology, biochemistry, physiology and genetics and an introduction to biostatistics and the principles of epidemiology. The instructional format includes about 50% didactic lectures, 30% laboratory and 20% small group sessions.

6457. Human Systems B

Six credits. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

A 38-week long medical school course taken in the first year of the combined MD/PhD program. The course is divided into four sections: Human Biology, Organ Systems 1, Organ Systems 2 and Organ Systems 3. The course covers the basic elements of human anatomy, histology, biochemistry, physiology and genetics and an introduction to biostatistics and the principles of epidemiology. The instructional format includes about 50% didactic lectures, 30% laboratory and 20% small group sessions.

6461. Clinical Radiation Sciences: Physics and Biology (Part A)

Two credits. Prerequisite: Instructor consent.

A continuous pair (i.e., MEDS 6461 and 6462) of semester lecture/seminar courses which examines the physical and biological principles underlying the uses of radiation and allied radiation sciences in clinical diagnosis and therapy. Characteristics of imaging systems, Nuclear Medicine, Radiation Therapy, biological effects of ionizing radiation, radiation measurement and dosimetry, and quality assurance will be covered through critical readings in texts and the literature. Available to individuals enrolled in residency programs of medical radiology, oral and maxillofacial radiology, and other specialties engaged in patient imaging. Some of these students will be enrolled in a concurrent degree program, either Master of Dental Science or PhD in Biomedical Sciences. Also available to individuals in Master's or PhD level graduate studies who desire an in-depth study of radiation sciences, and how they apply to patient care.

6462. Clinical Radiation Sciences: Physics and Biology (Part B)

Two credits. Prerequisite: Instructor consent.

A continuous pair (i.e., MEDS 6461 and 6462) of semester lecture/seminar courses which examines the physical and biological principles underlying the uses of radiation and allied radiation sciences in clinical diagnosis and therapy. Characteristics of imaging systems, Nuclear Medicine, Radiation Therapy, biological effects of ionizing radiation, radiation measurement and dosimetry, and quality assurance will be covered through critical readings in texts and the literature. Available to individuals enrolled in residency programs of medical radiology, oral and maxillofacial radiology, and other specialties engaged in patient imaging. Some of these students will be enrolled in a concurrent degree program, either Master of Dental Science or PhD in Biomedical Sciences. Also available to individuals in Master's or PhD level graduate studies who desire an in-depth study of radiation sciences, and how they apply to patient care.

6479. Chemistry and Biology of Drugs of Abuse

Five credits.

An in-depth interdisciplinary approach to the neurobiology of drug abuse, integrating basic and clinical sciences. Lectures, student presentations of original research reports, and laboratory exercises dealing with methods to measure neurotransmitter transport, ligand binding to receptors and transmitter action on ligand-activated channels.

6495. Independent Study

Variable (1-6) credits. May be repeated for credit.

A reading course for those wishing to pursue special topics in the biomedical sciences under faculty supervision.

6496. Laboratory Rotation

Variable (1-6) credits. May be repeated for credit.

6497. Graduate Seminar

Variable (1-6) credits. May be repeated for credit.

Reading and discussion of recent research developments in various areas of biomedical science.

6498. Special Topics in Biomedical Science

Variable (1-4) credits. May be repeated for credit.

6501. Communications for Biomedical Scientists

One credit. Prerequisite: Instructor consent, open only to students in the Biomedical Science Field of Study. Students taking this course will be assigned a final grade of S (satisfactory) or U (unsatisfactory).

This course is designed to introduce or reinforce biomedical science graduate students to some basic concepts in written and oral communication. The majority of the class will focus on writing as a fundamental skill for a variety of career options in the biomedical science field. The course will be comprised of interactive sessions on storytelling, basic sentence and paragraph composition skills, specific science-related writing including grants and manuscripts and effective oral presentation of scientific research. The different sections will involve lecturing as well as in-class and out-of-class writing exercises.

6502. Experimental Design, Rigor and Biostatistics

One credit. Offered during fall semester and letter graded. Prerequisite: Open only to second-year students the Biomedical Sciences Ph.D. program.

This course is designed to provide a general overview of the key components required for conducting rigorous and reproducible biomedical research. Experimental design, reagent authentication, biostatistics and other related topics will be covered with an emphasis on how they each contribute to the overarching goal of establishing rigor. The biostatistics section will cover commonly used analyses, with an emphasis on determining the most appropriate analysis for particular data sets. Additionally, considerations in analyzing human clinical versus animal-based research will be discussed, and statistical approaches such as meta-analysis and bioinformatics will be introduced to familiarize students with these techniques so that they can more effectively read and critique current scientific literature.