MEDICAL SCIENCES

Information regarding advanced concentration courses can be found here (http://gradcatalog.ufl.edu/graduate/colleges-departments/medicine/interdisciplinary-departments/medical/#coursestext).

GMS 5057 Medical Cell Biology 3 Credits
Grading Scheme: Letter Grade
Medical Cell Biology

GMS 5604 Medical Human Embryology 3 Credits
Grading Scheme: Letter Grade
Providing the developmental basis for understanding the anatomical relationships and organization of major structures within the thorax, abdomen, head/neck, and back/limbs regions of the body. Congenital malformations associated with given organ systems will also be discussed.
Prerequisite: GMS 5605: Medical Anatomy

GMS 5605 Medical Anatomy 3 Credits
Grading Scheme: Letter Grade
Medical human anatomy, using a combined regional and systemic approach to examine the relationships and organization of major structures within the thorax, abdomen, head/neck, and back/limbs regions of the body; correlations with diagnostic imaging and pathophysiology; medical-based scenarios to develop problem solving and critical thinking skills.
Prerequisite: Bachelor's degree.

GMS 5606L Medical Human Anatomy Laboratory 3 Credits
Grading Scheme: Letter Grade
Medical Human Anatomy Laboratory
Prerequisite: Bachelor's degree.

GMS 5613 Medical Human Anatomy by Diagnostic Imaging 3 Credits
Grading Scheme: Letter Grade
Focusing on the clinically relevant relationships of major anatomical structures within the thorax, abdomen, head/neck, and back/limbs regions of the body. Medically based scenarios will be used to develop problem solving and critical thinking skills. Anatomical imaging will be correlated to transverse, sagittal and coronal human sections.
Prerequisite: GMS 5605: Medical Anatomy

GMS 5630 Medical Histology 4 Credits
Grading Scheme: Letter Grade
Correlating diagnostic imaging of normal and pathologic tissues, and medical-based scenarios, in order to develop problem solving and critical thinking skills, using microscopic structure and function of human cells and tissues.
Prerequisite: Bachelor's degree.

GMS 5905 Special Topics in Biomedical Sciences 1-4 Credits, Max 4 Credits
Grading Scheme: Letter Grade
Analysis and discussion of contemporary topics and the development of biomedical sciences.

GMS 5909 Finding Biomedical Research Information and Communicating Science 1 Credit
Grading Scheme: Letter Grade
Designed to introduce the most important concepts, resources, methods, and tools used in searching for and communicating biomedical information - both literature and data. Students will explore topics including literature searching, bibliographic citation software, basic NCBI resources, funding sources, data management, and plagiarism and information ethics.

GMS 6001 Fundamentals of Biomedical Sciences I 5 Credits
Grading Scheme: Letter Grade
Integrated approach to cellular, molecular, biochemical, and genetic aspects of cell function.
Prerequisite: consent of instructor.

GMS 6003 Fundamentals of Graduate Research and Professional Development 1 Credit, Max 2 Credits
Grading Scheme: S/U
Practical knowledge and understanding of issues to increase chances for a successful graduate education and professional career in biomedical sciences.
Prerequisite: consent of instructor. Designed for new graduate students. ;
Corequisite: GMS 6001.

GMS 6004 IDP Practical Laboratory 2 Credits
Grading Scheme: Letter Grade
Five weeks of laboratory instruction complemented with supporting theoretical lectures and workshops on radiation safety, biosafety, and library resources. Practical laboratory experience in proteins and nucleic acids, including DNA cloning, PCR, Southern blotting, protein purification and characterization, and RNA methods for cDNA cloning.

GMS 6007 Fundamentals of Neuroscience 3 Credits
Grading Scheme: Letter Grade
Fundamental concepts on development, structure, function, and plasticity of nervous system.
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.

GMS 6008 Fundamentals of Physiology and Functional Genomics 2 Credits
Grading Scheme: Letter Grade
Fundamental physiological concepts. Emphasizes the impact of functional genomics technology on contemporary physiology.
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.

GMS 6009 Principles of Drug Action and Therapeutics 3 Credits
Grading Scheme: Letter Grade
Fundamental concepts of drug action, receptor structure and function, and pharmacokinetics.
Prerequisite: GMS 6001 or consent of instructor. Designed for first-year graduate students.

GMS 6012 Human Genetics 1 Credit, Max 3 Credits
Grading Scheme: Letter Grade
Theoretical framework for understanding the fundamentals of human genetics. Advanced technical tools used for research.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6013 Developmental Genetics 1 Credit, Max 3 Credits
Grading Scheme: Letter Grade
Theoretical framework for understanding the fundamentals of developmental genetics. Advantages and limitations of several model systems and their application to the study of development.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6014 Applications of Bioinformatics to Genetics 1 Credit
Grading Scheme: Letter Grade
Storage, retrieval, and analysis of information related to genetics.
Prerequisite: GMS 6001; consent of instructor.

GMS 6021 Organization and Development of the Nervous System 2 Credits
Grading Scheme: Letter Grade
Principles governing neural development and plasticity of the vertebrate central nervous system.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6022 Principles of Neurophysiology 3 Credits
Grading Scheme: Letter Grade
Principles governing intercellular communication within the nervous system.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6023 Molecular Neuroscience and Neuropharmacology 3 Credits
Grading Scheme: Letter Grade
Surveys the basic principles or neuropharmacology with an emphasis on the molecular pharmacology of CNS disorders. The specific focus is to provide a description of the cellular and molecular actions of drugs on synaptic transmission with in-depth discussion of drug-induced changes in functioning of the nervous system.
Prerequisite: Principles of Neuroscience I and II

GMS 6024 Princ Neuroscience 4 2 Credits
Grading Scheme: Letter Grade
Princ Neuroscience 4

GMS 6029 Brain Journal Club 1 Credit, Max 12 Credits
Grading Scheme: S/U
Opportunities to present and participate in discussions of top-tier research papers in the neurosciences.
Prerequisite: consent of instructor.

GMS 6034 Advanced Virology I: Genetics and RNA 1 Credit
Grading Scheme: Letter Grade
Theoretical framework for understanding the fundamental concepts of viral genetics. Methods of analysis used to elucidate the mechanisms of virus reproduction.
Prerequisite: consent of instructor.

GMS 6035 Advanced Virology II: RNA Viruses 1 Credit
Grading Scheme: Letter Grade
Molecular biology and genetics of virology, focusing on the molecular biology of RNA viruses.
Prerequisite: consent of instructor.

GMS 6036 Molecular Virology III: DNA Viruses 1 Credit
Grading Scheme: Letter Grade
Molecular biology and genetics of virology, focusing on replication and pathogenesis of DNA viruses.
Prerequisite: consent of instructor.

GMS 6038 Bacterial Genetics and Physiology 1 Credit
Grading Scheme: Letter Grade
Intermediate level graduate course aimed at helping students work with and study bacteria in their research, even those who are not microbiologists. It is a very practical educational experience with significant time spent on best practices for getting bacteria to work for the investigator.
Prerequisite: GMS 6121 or consent of instructor

GMS 6040 Host-Pathogen Interactions 1 Credit
Grading Scheme: Letter Grade
Survey of medical microbiology, focusing on the host response and subsequent evasion of that response by pathogens.
Prerequisite: consent of instructor.

GMS 6051 Signal Transduction 1 Credit
Grading Scheme: Letter Grade
Focuses on the mechanisms underlying cellular signal transduction.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6052 Ion Channels of Excitable Membranes 1 Credit
Grading Scheme: Letter Grade
Examines the background of ion channel proteins that regulate and respond to cell membrane potential. A cell's membrane potential is an important source of energy for regulating intracellular ion concentration, controlling the secretory process, and for electrical signaling in the nervous system.

GMS 6053 Cancer Biology and Therapeutics 1 Credit
Grading Scheme: Letter Grade
Integrated approach for teaching of pharmacology and physiology pertaining to cancer.
Prerequisite: GMS 6065 or consent of instructor.

GMS 6061 Nuclear Structure and Dynamics 1 Credit
Grading Scheme: Letter Grade
Cell biology of the nucleus. Offered in odd-numbered years.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6062 Protein Trafficking 1 Credit
Grading Scheme: Letter Grade
Movement of proteins in cell. Offered in even-numbered years.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6063 Cell Biology of Aging 1 Credit
Grading Scheme: Letter Grade
Recent developments in the field of aging.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6064 Tumor Biology 1 Credit
Grading Scheme: Letter Grade
Current understanding of the molecular basis of cancer. Offered in odd-numbered years.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6065 Fundamentals of Cancer Biology 3 Credits
Grading Scheme: Letter Grade
Broad-based introduction into causes of cancer, molecular and biological processes involved in malignancies, and current cancer treatment approaches.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6070 Sensory and Motor Systems 3 Credits
Grading Scheme: Letter Grade
For students that wish to gain insights into how animals detect, process and respond to sensory stimuli such as light, odors, sound and temperature. Students will learn about the molecular mechanisms and neural systems used by vertebrates and invertebrates to sense the external and internal world.
Prerequisite: Permission of instructor.

GMS 6073 Disorders of the Developing Nervous System 1 Credit
Grading Scheme: Letter Grade
Focuses on current research that is being conducted to build on an understanding of how the nervous system develops. Examines both cellular and molecular perspectives.
Prerequisite: GMS 6007 or consent of instructor.

GMS 6079 Computers in Biology 1 Credit
Grading Scheme: Letter Grade
Students will be introduced to the use of computers in studies of protein and nucleic acid sequences and cellular function.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6080 Basic Magnetic Resonance Imaging 1 Credit
Grading Scheme: Letter Grade
Principles behind nuclear magnetic resonance imaging (MRI) and spectroscopy (MRS) and how these methods are applied to studies of the human brain.
Prerequisite: GMS 6007 or consent of instructor.

GMS 6082 Introduction to Functional Magnetic Resonance Imaging 1 Credit
Grading Scheme: Letter Grade
Functional magnetic resonance imaging (fMRI) is at the forefront of many research fields in neuroscience. the method is widely in human and animal studies to investigate neural mechanisms. Introduction to Functional MRI will provide students with the basic and practical principles underlying fMRI of the brain. Students will complete the course having an in-depth introduction to neurophysiological mechanisms that couple magnetic resonance phenomenon to task- or stimulus-dependent changes in neuronal activity and cerebral metabolism.
Prerequisite: Consent from instructor

GMS 6090 Research in Medical Sciences 1-10 Credits, Max 10 Credits
Grading Scheme: S/U
Supervised research other than that for the thesis or dissertation in biochemistry and molecular biology, genetics, immunology and microbiology, molecular cell biology, neuroscience, and physiology and pharmacology.

GMS 6096 Introduction to NIH Grant Writing for Biomedical Sciences 1 Credit
Grading Scheme: Letter Grade
This 14-week course will cover introductory topics related to preparing and submitting an NIH grant application. The format will be a one-hour lecture once a week by accomplished NIH-funded researchers. Target audience is advanced graduate students, postdocs, junior faculty, and senior faculty seeking an introduction to current grant submission procedures.

GMS 6099 Research Methods in Gerontology 3 Credits
Grading Scheme: Letter Grade
Teaching proficiency on critical assessment and understanding of methods used in research studies related to biomedical aging and clinical geriatrics. Students will gain the ability to understand, gather information and assess the quality of these studies including basic content and construction of peer reviewed journal articles.

GMS 6108 Bacterial Physiology, Antibiotics, and Genetics 3 Credits
Grading Scheme: Letter Grade
Combines three one-credit courses: GMS 6038 Bacterial Genetics and Physiology, 6169 Antimicrobial Strategies, and GMS 6153 Advanced Bacterial Genetics. Material on metabolism, gene expression, protein synthesis and localization, antibiotics and resistance, and genetics is presented in a combination of lecture and literature-based formats.

GMS 6121 Infectious Diseases 3 Credits
Grading Scheme: Letter Grade
Survey of medical microbiology directed at understanding infectious disease in terms of molecular pathogenesis, bacterial physiology, and genetics.
Prerequisite: Consent of instructor.

GMS 6123 Tropical Medicine Patient Case and Journal Discussion 1 Credit
Grading Scheme: Letter Grade
Tropical Medicine Patient Case and Journal Discussion

GMS 6132 Introductory Gene and Immunotherapy 2 Credits
Grading Scheme: Letter Grade
Provides an overview of gene and immunotherapy with emphasis on translational applications. Students will gain a fundamental understanding of the principles and mechanisms of gene and immunotherapy, specifically molecular biology of gene therapy and basic immunology and immunotherapy. Preclinical and clinical applications of both will be discussed.
Prerequisite: MCB 5205 or GMS 6121; BCH 5413 or MCB 6937; or permission of instructor.

GMS 6140 Principles of Immunology 4 Credits
Grading Scheme: Letter Grade
Fundamental principles of basic and experimental immunology, from first engagement of innate immunity to the generation of the adaptive immune response and its clinical consequences.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6143 Cells of the Innate Immune System 1 Credit
Grading Scheme: Letter Grade
Emphasizes the critical role that innate immune cells play in infectious and autoimmune diseases. Emphasis will be on understanding how individual innate immune cell types (macrophages, dendritic cells, natural killer cells and neutrophils) were discovered and understanding the fundamental roles of these cells within the immune response.
Prerequisite: GMS 6140

GMS 6153 Advanced Bacterial Genetics 1 Credit
Grading Scheme: Letter Grade
Advanced principles of bacterial genetics, emphasizing work with bacteria and genetic constructs as tools in biotechnologies.
Prerequisite: GMS 6038 or consent of instructor.

GMS 6160 Introduction to Oral Biology I 2 Credits
Grading Scheme: Letter Grade
Review of basic principles of prokaryotic and eukaryotic molecular biology, gene therapy, stem cell biology, and tissue engineering and the application of those principles to study of normal and abnormal conditions of oral cavity.

GMS 6161 Introduction to Oral Biology II 2 Credits
Grading Scheme: Letter Grade
Review of current information on psychophysiology and biology of oral pain; oral infectious diseases; oral ramifications of inflammation, hypersensitivities, and immune deficiencies; bone disorders; and oral health in normal aging.
Prerequisite: GMS 6160 or consent of instructor.

GMS 6162 Oral Microbiology and Immunology 2 Credits
Grading Scheme: Letter Grade
Provides a strong foundation of all aspects that relate to oral microbiology and oral immunology. Particular attention will be devoted to microbial diseases of the oral cavity (such as dental caries and periodontal disease) and the relationship between oral and general health.
Prerequisite: fundamentals of microbiology course or equivalent.

GMS 6169 Antimicrobial Strategies 1 Credit
Grading Scheme: Letter Grade
Recent developments in the field of antimicrobial strategies including antiobiotics and their mechanisms of action, antibiotic resistance mechanisms, phage therapy, antimicrobial target identification, and vaccine approach.
Prerequisite: consent of instructor.

GMS 6193 Research Conference in Oral Biology 1-3 Credits, Max 8 Credits
Grading Scheme: S/U
Required of graduate students in oral biology; open to others by departmental approval. Critical discussion and appraisal of current research in the department by students and faculty.

GMS 6195 Epigenetics Journal Club 1 Credit, Max 12 Credits
Grading Scheme: S/U
Presentation and critical discussions of recent original papers published in high-impact journals relating to the topic of epigenetics.
Prerequisite: consent of instructor.

GMS 6196 Virology Journal Club 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
Presentation and critical discussions of recent original articles in the virology literature.

GMS 6198 Bacterial Pathogenesis Journal Club 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
Presentation and critical discussion of recent original papers on bacterial pathogenesis published in high-impact journals. Offered spring and fall term.

GMS 6221 Ethics in Genetics 1 Credit
Grading Scheme: Letter Grade
Presentation and critical discussion of relevant topics pertaining to ethics, policy and translation in genetics research.
Prerequisite: Consent of instructor

GMS 6224 Foundations in Precision Medicine: Medical Molecular Genetics 1 Credit
Grading Scheme: Letter Grade
Focuses on human genetics by providing foundational knowledge related to the human genome structure and organization, the molecular pathogenesis at the gene and chromosome level, and the application of genetic knowledge in modern medicine using real world examples.
Prerequisite: Students must have basic knowledge of genetics and molecular biology.

GMS 6231 Genomics and Bioinformatics 3 Credits
Grading Scheme: Letter Grade
Principles of genomic characterization and bioinformatic analysis of eukaryotes.
Prerequisite: STA 6166 and PCB 5065 or consent of instructor.

GMS 6232 Advanced Applications of Bioinformatics in Genetics 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
Applying bioinformatics and computational approaches to solve research problems.
Prerequisite: GMS 6014 or consent of instructor; programming experience.

GMS 6234 Introduction to phylodynamics: A practical approach to molecular phylogenetics of pathogens 3 Credits
Grading Scheme: Letter Grade
Principles of molecular evolution. Mathematical models of DNA/RNA sequence evolution and their application to phylogenetic inference. Mathematical and statistical tools implemented in phylogenetic-tree reconstruction methods and molecular clock calibration. Introduction to coalescent theory. Phylodynamic models and their application to the study of viral and bacterial pathogens. Practical computer sessions analyzing real data with the MEGA5 and BEAST software packages.

GMS 6251 Molecular Therapy I – Vectors and Molecular Mechanisms 1 Credit
Grading Scheme: Letter Grade
Gene therapy is an established molecular medicine for treatment of multiple genetic diseases (e.g., primary immune deficiencies, inherited forms of blindness) and cancers. This course covers the most important/widely studied diseases and applications of gene therapy. Emphasis is given to diseases successfully treated by gene therapy in clinical trials.
Prerequisite: GMS 6001 or instructor approval

GMS 6252 Molecular Therapy II – Disease Targets and Applications 1 Credit
Grading Scheme: Letter Grade
Gene therapy is an established molecular medicine for treatment of multiple genetic diseases (e.g., primary immune deficiencies, inherited forms of blindness) and cancers. This course will be covering the most important/widely studied diseases and applications of gene therapy. Emphasis is given to diseases successfully treated by gene therapy in clinical trials.
Prerequisite: GMS 6251 Molecular Therapy I or instructor approval

GMS 6253 Molecular Therapy III – Immunology of Gene Transfer 1 Credit
Grading Scheme: Letter Grade
This course will be covering the interaction between gene transfer vectors and their therapeutic gene products and the immune system, including mechanisms of innate and adaptive immune responses against gene-based drugs, viral immunology, immune modulation, immune tolerance, and use of gene transfer to enhance immune responses against cancer or infectious disease.
Prerequisite: GMS 6001 or instructor approval

GMS 6290 Genetics/Genomics Program Graduate Seminar 1 Credit
Grading Scheme: Letter Grade
Presentations, seminars, and critical discussions of recent original research relating to genetics and genomics.
Prerequisite: enrolled in campus-wide genetics and genomics program or consent of instructor.

GMS 6331 Stem Cell Biology 1 Credit
Grading Scheme: Letter Grade
Recent progress in mammalian stem cell research.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6335 Advanced Stem Cell Biology: Tissue Engineering 1 Credit
Grading Scheme: Letter Grade
Current state of the art in using stem cells and other technologies to engineer tissues and organs for therapeutic use.
Prerequisite: GMS 6331 and GMS 6336

GMS 6336 Advanced Stem Cell Biology: Regenerative Medicine 1 Credit
Grading Scheme: Letter Grade
Potential clinical applications of tissue-specific, adult stem cells; derivation, manipulation, uses, and limitations.
Prerequisite: GMS 6331.

GMS 6337 B Cell Development in Health and Disease 1 Credit
Grading Scheme: Letter Grade
Advanced understanding of the role and regulation of B cells, emphasizing dysregulation of B cell functions in autoimmune diseases.
Prerequisite: GMS 6031 , GMS 6032 , and GMS 6033 or equivalent. Strong background in immunology.

GMS 6338 Recent Advances in Cancer Metastasis 1 Credit
Grading Scheme: Letter Grade
Recent progress in cancer metastasis including the interactions between tumor cells and host environments at molecular and cellular levels during metastatic process as well as tools and models available for cancer metastasis research.
Prerequisite: None.

GMS 6350 Forensic Investigation 3 Credits
Grading Scheme: Letter Grade
The student will obtain a thorough understanding of the various professional disciplines that must come together to successfully process a crime scene that involves human death. Students will also explore the basic scientific and legal principles of physical evidence as well as issues of rights to privacy and evidence integrity.

GMS 6351 Trauma Analysis 3 Credits
Grading Scheme: Letter Grade
Explains the differences between trauma to soft tissue and trauma to bone and how to distinguish between each. Ante-, peri-, or postmortem trauma will be compared to natural taphonomic effects and animal scavenging.

GMS 6352 Artifacts of Decomposition 3 Credits
Grading Scheme: Letter Grade
Describes each of the main artifacts of decomposition that can be utilized to estimate the post mortem interval. Both biological and non-biological methods will be discussed, with a specific focus on the strengths and weaknesses of each method.

GMS 6352L Artifacts of Decomposition Laboratory 3 Credits
Grading Scheme: Letter Grade
Provides a hands-on approach teaching concepts of human decomposition and PMI estimation. Students will become familiar with the multidisciplinary nature of death investigations through practical exercises to develop abilities to recognize and understand artifacts of decomposition including scattered skeletal remains recovery and clandestine grave detection and excavation.

GMS 6353 Gross Anatomical Exam and Forensic Pathology 3 Credits
Grading Scheme: Letter Grade
Students will learn about the structure of all major body systems. Each is discussed in anatomical terms, and each module will culminate with discussions on the unique disease processes that can affect each body system. Focus will be given to the types of anatomical and/or pathological anomalies relevant at autopsy.

GMS 6354 Communication Skills in Forensic Science Context 3 Credits
Grading Scheme: Letter Grade
Provides the student with an introduction to the importance of scientific writing and professionalism. Foundational issues including ethics and plagiarism will be discussed and several modules will focus on writing specialized forensic reports, with the intent to bring the information into a court of law.

GMS 6355 Traffic Homicide Investigation and Reconstruction 3 Credits
Grading Scheme: Letter Grade
Students will learn the principles of traffic homicide investigation and the accepted methodologies necessary to reconstruct collision events. Topics will include Newton's Laws of Motion, visual observation and documentation of physical evidence, research, calculation of vehicle parameters, calculation of scene parameters, analysis of human factors and calculation of time-distance relationships.

GMS 6356 Applied Osteology 3 Credits
Grading Scheme: Letter Grade
Provides a specialized application to the principles of forensic anthropology via the more common practices of a forensic anthropologist. Addressing the biological profile, comparative osteology, and unique cases that would involve a forensic anthropologist, the student will gain a better understanding of how osteology is applied in forensic casework.

GMS 6357 Forensic Photography 3 Credits
Grading Scheme: Letter Grade
Provides instruction on the history of forensic photography and utilization of a camera in a crime scene setting. Students will learn basic photography skills, camera operation, exposure control, relational photographs, and flash control for crime scene and evidence documentation.

GMS 6357L Forensic Photography Laboratory 3 Credits
Grading Scheme: Letter Grade
Provides a hands-on approach regarding the basic concepts of photographing crime scenes. Students will examine the history ad operation of the digital camera, admissibility and court challenges of photos, camera functions, photo sequencing and composition, use of lighting, flash, ALS, macro photography, videography, and include photo exercises.

GMS 6358 Forensic Medicine III 4 Credits
Grading Scheme: Letter Grade
Examines forensic pathology within the context of crime scene investigation. Postmortem changes will be evaluated and differentiated from antemortem wounds. Students will learn to evaluate wounds and patterns of injury and associate these findings at autopsy with evidence and circumstances identified at the crime scene.

GMS 6359 Principles of Bloodstain Pattern Analysis 3 Credits
Grading Scheme: Letter Grade
Will provide a knowledge in the field of bloodstain pattern interpretation. It will illustrate the scientific principles and practical application of bloodstain pattern analysis to actual casework. Emphasis is placed on proper identification, documentation, interpretation, and presentation of bloodstain patterns. Includes analyzing multiple bloodstain events and cognitive bias.

GMS 6359L Principles of Bloodstain Pattern Analysis Laboratory 3 Credits
Grading Scheme: Letter Grade
Designed to give students a hands-on approach regarding the basic concepts of bloodstain pattern analysis and interpretation. Students will become familiar with the history, properties of blood, distribution, shapes, sizes, mechanisms to create patterns/stains, surface textures, and methods to obtain Area of Convergence and Area of Origin.

GMS 6360 Principles of Forensic Medicine I 4 Credits
Grading Scheme: Letter Grade
Introduces the basic concepts, techniques and practical philosophies that comprise the foundation of Forensic Pathology. Topics include the forensic autopsy, death scene investigation, techniques in human identification, death scene investigation and analysis of significant factors that contributed to a decedent's demise. Forensic histology is also reviewed.

GMS 6361 Principles of Forensic Medicine II 4 Credits
Grading Scheme: Letter Grade
Advanced topics in Forensic Medicine and Pathology with complex situations and findings in death investigations are covered. Deaths occurring under suspicious circumstances, sudden, pediatric, child and elder abuse, diseases, toxins, drugs, and those via environmental exposure are addressed. Medical devices, implants and their contribution to morbidity and mortality is reviewed.
Prerequisite: GMS 6361

GMS 6362 Principles of Crime Scene Investigation 3 Credits
Grading Scheme: Letter Grade
Designed to give students an overall understanding of the basic concepts of crime scene investigation and related examination of evidentiary items. Students will become familiar with the multidisciplinary nature of forensic science.

GMS 6362L Principles of Crime Scene Investigation Laboratory 3 Credits
Grading Scheme: Letter Grade
Gives students a hands-on approach regarding the basic concepts of forensic science and crime scene investigation and related examination of evidentiary items. Students will become familiar with the multidisciplinary nature of forensic science and several of the specializations within them and perform tasks pertaining to each specialization.

GMS 6363 Principles of Osteology 3 Credits
Grading Scheme: Letter Grade
Focuses on the principles of forensic anthropology by overview of the human skeleton and applications in death investigations. Students will study bone biology and an overview of human osteology and skeletal identification. Cases will be discussed including fragmented remains, mass fatalities, and skeletal diseases.

GMS 6364 Forensic Botany 3 Credits
Grading Scheme: Letter Grade
This course will provide a foundation for botanists, teachers, students, and investigators who aim to understand how to collect and utilize plants for evidence in a forensic investigation. History of forensic botany, landmark cases, case studies, and techniques of field collection will all be address and described within this course.

GMS 6365 Principles of Forensic Psychology 3 Credits
Grading Scheme: Letter Grade
This course introduces the field of forensic psychology and the relationship between psychological disorders and the adversarial legal system. This course will focus on research, testimony, and oral and written consultation on psychological issues and disorders as they pertain to the administration of justice.

GMS 6382 Special Topics in Immunology 1-3 Credits
Grading Scheme: Letter Grade
Analysis and discussion of contemporary topics in development of current concepts. Evaluation of the most recently published research literature. Seminars and discussions with invited speakers.
Prerequisite: GMS 6140 or consent of instructor.

GMS 6383 Current Topics in Immunotherapy 1 Credit
Grading Scheme: Letter Grade
Becoming acquainted with concepts of immune therapy for the treatment of cancer and autoimmune diseases. Students will be expected to develop critical thinking skills with regards to identifying problems, providing possible solutions and debating areas related to experimental design and data interpretation. The course will include the discussion of journal articles and presentations. The class will focus to a large extent on lectures and student presentations of both historically significant as well as recent journal articles.
Prerequisite: GMS 6140

GMS 6400C Principles of Physiology 6 Credits
Grading Scheme: Letter Grade
Physiology of mammalian organ systems, with special reference to the human.
Prerequisite: consent of instructor.

GMS 6401 Medical Renal Physiology 2 Credits
Grading Scheme: Letter Grade
Teaches the functions of the renal system of human body at a level required for clinical medicine and basic research in medical physiology. The course covers normal physiology, as well as selected diseases. Concepts are taught using a combination of lectures, online workshop, and online problem sets.
Prerequisite: Requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6402 Medical Respiration Physiology 3 Credits
Grading Scheme: Letter Grade
Teaches the functions of the pulmonary system of human body at a level required for clinical medicine and basic research in medical physiology. The course covers normal physiology, as well as selected diseases. Concepts are taught using a combination of lectures, online workshop, and online problem sets.
Prerequisite: Requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6405 Fundamentals of Endocrine Physiology 1 Credit
Grading Scheme: Letter Grade
Human body endocrine system physiology.
Prerequisite: GMS 6001 or consent of instructor. For 1st- and 2nd-year graduate students.

GMS 6406 Fundamentals of Pulmonary/Respiratory Physiology 1 Credit
Grading Scheme: Letter Grade
Human body pulmonary/respiratory system physiology.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6408 Fundamentals of Renal Physiology 1 Credit
Grading Scheme: Letter Grade
Human body gastrointestinal system physiology.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6410 Physiology of the Circulation of Blood 2 Credits
Grading Scheme: Letter Grade
Physiology of the component parts of the circulation. The relation of structure and function. Emphasizes control mechanisms.

GMS 6411 Fundamentals of Cardiovascular Physiology 1 Credit
Grading Scheme: Letter Grade
Human body cardiovascular system physiology.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6413 Advances in Hypertension Research 2 Credits
Grading Scheme: Letter Grade
Exposes graduate students, post docs, and fellows to important aspects of hypertension research.
Prerequisite: GMS 6008: Fundamentals of Physiology and Functional Genomics

GMS 6414 Advanced Renal Physiology 2 Credits
Grading Scheme: Letter Grade
Advanced knowledge of renal physiology and pathophysiology.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6415 Fundamentals of Gastrointestinal Physiology 1 Credit
Grading Scheme: Letter Grade
Gastrointestinal system of human body.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6417 Integrative Aging Physiology 3 Credits
Grading Scheme: Letter Grade
Focusing on the effect of the aging process on the physiology of energy metabolism and the impact to systems involved in maintaining physical and cognitive function. This will include a discussion of changes to skeletal muscle and neurological systems that are known to become dysregulated with age.
Prerequisite: GMS 6400C: Principles of Physiology

GMS 6419 Medical Endocrinology and Reproduction 3 Credits
Grading Scheme: Letter Grade
Teaches the functions of the endocrine and reproductive systems of human body at a level required for clinical medicine and basic research in medical physiology. The course covers normal physiology, as well as selected diseases. Concepts are taught using a combination of lectures, online workshop, and online problem sets.
Prerequisite: Requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6421 Cell Biology 4 Credits
Grading Scheme: Letter Grade
Fundamental mechanisms of cell functions, specializations, and interactions that account for the organization and activities of basic tissues.
Prerequisite: undergraduate biochemistry or cell biology or consent of instructor. Taught in conjunction with 1st year IDP core course.

GMS 6440 Fundamentals of Medical Physiology 1 Credit
Grading Scheme: Letter Grade
Teaches the basic functions of the human body at a level required for clinical medicine and basic research in medical physiology. This is an introductory course to be taken before courses on specific organ systems physiology. The course covers normal physiology, as well as selected diseases. Concepts are taught using a combination of lectures, online workshops, and online problem sets.
Prerequisite: Requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6470 Adv. Respiration Physiology 1 3 Credits
Grading Scheme: Letter Grade
Covers a quantitative understanding of atmospheric, alveolar, and blood gas pressures, as well as quantitative understanding of oxygen carriage in blood and alterations in blood chemistry that result from changes in blood gases. Particularly, building an understanding of these concepts as defined in theoretical models as developed by theoretical physiologists.
Prerequisite: GMS 6400C or (GMS 6440 and GMS 6402 and GMS 6474).

GMS 6471 Fundamentals of Physiology and Functional Genomics I 1 Credit
Grading Scheme: Letter Grade
Fundamental physiological concepts with emphasis on the impact of functional genomics technology on contemporary physiology. Focuses on an overview of human physiology, cardiovascular system and muscle physiology. May be taken concurrently with Fundamentals of Physiology and Functional Genomics II and/or III.
Prerequisite: Permission of instructor.

GMS 6472 Fundamentals of Physiology and Functional Genomics II 1 Credit
Grading Scheme: Letter Grade
Fundamental physiological concepts with a focus on the impact of functional genomics technology on contemporary physiology. Emphasizes respiratory, renal, endocrine and autonomic nervous systems.
Prerequisite: Permission of the instructor

GMS 6473 Fundamentals of Physiology and Functional Genomics III 1 Credit
Grading Scheme: Letter Grade
Fundamental physiological concepts with a focus on the impact of functional genomics technology on contemporary physiology. Emphasizes gastrointestinal system and modern experimental approaches in physiology.
Prerequisite: Permission of instructor.

GMS 6474 Medical Cardiovascular and Muscle Physiology 3 Credits
Grading Scheme: Letter Grade
Teaches the functions of muscle and the cardiovascular system of human body at a level required for clinical medicine and basic research in medical physiology. Covers normal physiology, as well as selected diseases. Concepts are taught using a combination of lectures, online workshop, and online problem sets.
Prerequisite: Requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6475 Adv. Respiration Physiology 2 3 Credits
Grading Scheme: Letter Grade
Covers a quantitative understanding of hypoxia, hypo- and hyper-baric atmospheric pressures, physical properties of breathing (lung and chest wall compliances, airway turbulence), and central nervous system mechanisms controlling respiration (arterial and medullary chemoreflexes, cardiopulmonary receptors, vasomotor and heart rate responses to changing blood gases).
Prerequisite: GMS 6400C or (GMS 6440 and GMS 6402 and GMS 6474).

GMS 6476 Fundamentals of Skeletal Muscle 3 Credits
Grading Scheme: Letter Grade
Provides a comprehensive background of skeletal muscle properties, focusing on key aspects of function at the protein, cellular and whole organ level. Major topics include muscle contraction and force generation, fuel sources and energy utilization, growth and development, and an introduction to pathology.

GMS 6479 Medical Gastrointestinal Physiology 2 Credits
Grading Scheme: Letter Grade
Teaches the functions of the digestive system of human body at a level required for clinical medicine and basic research in medical physiology. The course covers normal physiology, as well as selected diseases. Concepts are taught using a combination of lectures, online workshop, and online problem sets.
Prerequisite: Requires a BA or BS and a strong science foundation with at least 5 full semester courses related to Biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6483 Theories of Aging 3 Credits
Grading Scheme: Letter Grade
Humans have theorized about aging since 3000 AD in an attempt to explain how specific changes during the lifecourse are an integral part of aging. This course will explore the fundamental theories of aging across a wide array of disciplines to give the learner a broad understanding of "healthy" aging.

GMS 6484 Geriatric and Age Related Diseases 3 Credits
Grading Scheme: Letter Grade
Providing an overview of the practice of providing care to geriatric populations. This includes an understanding of common syndromes, conditions and diseases that are relevant to the quality of life in older adults.

GMS 6485 Population Based Research on Aging 3 Credits
Grading Scheme: Letter Grade
Geared toward population-based research on diseases of elders that include: neurodegeneration, dementia, pulmonary disorders, chronic kidney disease, musculoskeletal, cardiovascular, and metabolic health conditions. At the completion of this course, students will be able to evaluate population-based research on aging and use these concepts in everyday practice.

GMS 6486 Biology of Aging 3 Credits
Grading Scheme: Letter Grade
Students will learn: 1) major theories of biological aging, including Evolutionary Neuroendocrine, and Free Radical Theories of Aging, 2) the roles of vital organ systems, key cellular programs, and 3) how the aging process can be delayed through pharmaceutical and genetic manipulation, or calorie restriction.

GMS 6487 Anti-aging Interventions 3 Credits
Grading Scheme: Letter Grade
Aging is a complex process determined by both genetic and environmental factors. By manipulating these aging-related factors, researchers have been able to extend lifespan and healthspan in lab animals. This course will focus on the current and emerging interventions to promote human lifespan and healthspan.

GMS 6491 Journal Club in Physiology 1 Credit, Max 12 Credits
Grading Scheme: S/U
Timely research papers in all areas of physiology; namely, cellular physiology, molecular physiology, and functional genomics.

GMS 6495 Seminar in Physiology 1 Credit
Grading Scheme: S/U
S/U

GMS 6504 Advanced Medical Pharmacology 2 Credits
Grading Scheme: Letter Grade
This two-credit course is for basic and clinical scientists and others that wish to learn complex pharmacological principles as well as other advanced topics in the areas of drug design, development, and mechanisms. Topics to be discussed, among others, include receptor theory, pharmacological assays, binding, receptor biology, and molecular docking.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics; GMS 6551.

GMS 6506 Biologic Drug Development 1 Credit
Grading Scheme: Letter Grade
Explores the manufacturing and testing of biomedical products, quality control, quality assurance responsibilities, and regulatory compliance, providing practical understanding of the successes and hurdles that are faced in biopharmaceutical product development today.

GMS 6510 Pharmacology of Cannabis, Tobacco, and Vaping 2 Credits
Grading Scheme: Letter Grade
This two-credit course if for those that wish to gain knowledge in the pharmacology of cannabis, tobacco, and vaping. Material will focus on both their medical use and toxicology. This information is important for both clinicians treating patients and scientists looking to develop new therapies.
Prerequisite: This course requires at least 5 full semester courses related to biology, chemistry and/or physics.

GMS 6520 Medical Pharmacology and Therapeutics I: The Nervous System 2 Credits
Grading Scheme: Letter Grade
Will cover the fundamentals of small molecule drugs and therapeutic biologics and their actions on the central nervous system, the peripheral nervous system and the autonomic nervous system. The course prepares students for more advanced studies of pharmacology and therapeutics in the context of human physiology and pathophysiology.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6530 Medical Pharmacology and Therapeutics II: Cardiovascular, Renal and Respiratory Systems 2 Credits
Grading Scheme: Letter Grade
Covers the fundamentals of small molecule drugs and therapeutic biologics and their actions on the heart, vasculature, kidney and other parts of the cardiovascular, renal and respiratory systems. The course prepares students for more advanced studies of pharmacology and therapeutics in the context of human physiology and pathophysiology.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6531 Medical Pharmacology and Therapeutics III: Endocrine, Musculoskeletal and Reproductive Systems 2 Credits
Grading Scheme: Letter Grade
Covers the fundamentals of small molecule drugs and therapeutic biologics and their actions in the treatment and/or control of endocrine disorders, reproduction, gastrointestinal system, musculoskeletal system and skin. The course prepares students for more advanced studies of pharmacology and therapeutics in the context of human physiology and pathophysiology.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6540 Medical Pharmacology and Therapeutics IV: Cancer, Antimicrobial and Antiparasitic Agents 2 Credits
Grading Scheme: Letter Grade
Covers the fundamentals of small molecule drugs and therapeutic biologics and their actions in the treatment of cancers and of microbial and/or parasitic infections. The course will prepare students for more advanced studies of pharmacology and therapeutics in the context of human physiology and pathophysiology.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6551 Fundamentals of Medical Pharmacology and Therapeutics 1 Credit
Grading Scheme: Letter Grade
Covers the fundamentals of small molecule drugs and therapeutic biologics (e.g., peptides, antibodies, gene and stem cell therapies) and their actions in the body. The course will prepare students for more advanced studies of pharmacology and therapeutics in the context of human physiology and pathophysiology.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics. A minimum undergraduate GPA = 2.0 is required for admission.

GMS 6552 Cell Signaling & Therapeutics 2 Credits
Grading Scheme: Letter Grade
This two-credit course is for those that wish to gain knowledge of the signaling mechanisms that exist in human cells. These mechanisms are the source of many new drug targets and understanding their biology is critical for the development of new therapeutics and an advanced understanding of current treatment options.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics.

GMS 6560 Molecules to Man: Past, Present and Future Therapeutic Strategies for Disease 3 Credits
Grading Scheme: Letter Grade
Covers the therapeutic application of small molecule drugs and biologics to the treatment of disease. It will provide students with a basic knowledge of mechanism(s) of action of prototype therapeutics, educate students on the history of drug development, and consider current approaches for development of new therapeutics.
Prerequisite: GMS 6009

GMS 6563 Molecular Pharmacology 1-3 Credits, Max 3 Credits
Grading Scheme: Letter Grade
Biochemical approach to the actions of drugs, stressing analysis of drug-receptor interactions, structure-activity relationships, kinetics of distribution of drugs, and metabolism of foreign compounds.
Prerequisite: GMS 6009 or consent of instructor.

GMS 6590 Seminar in Pharmacology 1 Credit, Max 15 Credits
Grading Scheme: Letter Grade
Research reports and discussions of current research literature by graduate students, faculty, and invited lecturers.
Prerequisite: GMS 6500.

GMS 6591 Communicating Pharmacology 1 Credit
Grading Scheme: Letter Grade
Communicating science and medicine to the general population is extremely important. This course will require students to create and record a presentation that communicates the science of both the pathophysiology and the pharmacology of a disease and its treatment. The target audience for this presentation is the general population.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics.

GMS 6592 Ion Channels Journal Club: Pharmacology, Biophysics, and Neuroscience of Excitable Membranes 1 Credit
Grading Scheme: S/U
Recent papers in the context of larger issues in therapeutics and neuroscience. Discussions led by students and faculty.
Prerequisite: consent of instructor.

GMS 6594 Pharmacology Literature 1 Credit
Grading Scheme: Letter Grade
The course will consist of recorded paper discussions that will be used to facilitate an online discussion. Each student will be required to record their own paper discussion. In addition, students will be required to complete problem sets in conjunction with each paper.
Prerequisite: This course requires a BA or BS and a strong science foundation with at least 5 full semester courses related to biology, chemistry and/or physics.

GMS 6607C Essential Human Anatomy 4 Credits
Grading Scheme: Letter Grade
Human dissection and application of anatomical principles underlying clinical sciences including systemic approach to radiographic interpretation. Offered summer term B.
Prerequisite: consent of instructor, recommendation of graduate adviser, good standing in approved master's or doctoral program.

GMS 6609 Advanced Gross Anatomy 2-4 Credits, Max 6 Credits
Grading Scheme: Letter Grade
Regional and specialized anatomy of the human body taught by laboratory dissection, conferences, and demonstrations.

GMS 6610 Anatomy of the Peripheral Nervous System 3 Credits
Grading Scheme: Letter Grade
The Anatomy of the Peripheral Nervous System Course will be presented by a combination of online lectures and online laboratory sessions. The anatomy and function of spinal and cranial nerves of the human body will be discussed and observed in the Vivile Human Body software program. Anatomical imaging will be correlated to transverse, sagittal, and coronal human sections. Medical-based scenarios, e.g., nerve lesions, will be used to promote retention and recall.
Prerequisite: Students are expected to have already taken GMS5605 Online Medical Human Anatomy; GMS5606 Medical Human Anatomy Laboratory and permission of instructors.

GMS 6622 Mitochondrial Biology in Aging and Disease 2 Credits
Grading Scheme: Letter Grade
Basic biology of mitochondria; mitochondria in aging and disease; assessments for mitochondrial function and genetic variance.
Prerequisite: graduate standing or consent of instructor

GMS 6635 Organization of Cells and Tissues 3 Credits
Grading Scheme: Letter Grade
Three credit full semester course covering tissues and nine organ systems related to cell and tissue biology.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6647 Transcriptional and Translational Control of Cell Growth and Proliferation 1 Credit
Grading Scheme: Letter Grade
Fundamental mechanisms that govern cell growth and proliferation.
Prerequisite: 1st and 2nd Yr IDP Students.

GMS 6683 Fundamentals of Vascular Physiology and Pathology 2 Credits
Grading Scheme: Letter Grade
Seeking to introduce the fundamentals of vascular biology and discussing the current understanding of the pathogenesis of common vascular diseases. Subjects to be covered include: mature and progenitor vascular cells, vascular physiology and histology, and the cellular and molecular mechanisms that drive vascular stenosis/restenosis and aortic aneurysm.
Prerequisite: GMS 6001

GMS 6690 Molecular Cell Biology Journal Club 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
Faculty-student discussion of research papers and topics.

GMS 6691 Special Topics in Cell Biology and Anatomy 1-4 Credits, Max 10 Credits
Grading Scheme: Letter Grade
Readings in recent research literature of anatomy and/or applied disciplines including cell, developmental, and reproductive biology.

GMS 6692 Research Conference in Anatomy and Cell Biology 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
Research reports and discussions of current research by graduate students, faculty, and invited speakers.

GMS 6701 Functional and Comparative Neuroanatomy for Professionals 5 Credits
Grading Scheme: Letter Grade
This course covers the structure and function of all major systems in the central nervous system of humans, quadrupeds, and rodents (brain and spinal cord). The anatomical studies and brain function will be complemented by clinical cases. At the end of this course, you will have both a working knowledge of human and comparative neuroanatomy, and you will also be able to use this knowledge to explain how disruption of brain structure leads to changes in human behavior and cognition.
Prerequisite: This course will be required for first year neuroscience graduate students. Any other graduate student must obtain instructor's permission to register.

GMS 6705 Functional Human Neuroanatomy 4 Credits, Max 4 Credits
Grading Scheme: Letter Grade
Intensive introduction to the anatomy, function, and dysfunction of the human central nervous system.
Prerequisite: consent of instructor.

GMS 6709 Current Topics in Vision 1 Credit
Grading Scheme: Letter Grade
Genetics, molecular biology, and biochemistry underlying vision and the diseases that affect this important human sense.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6711 Neurobiology of Pain 1 Credit
Grading Scheme: Letter Grade
Overview of neurobiological processes involved in pain, including methods of investigating pain processing in humans and other animals.
Prerequisite: GMS 6001 or consent of instructor.

GMS 6712 Biological Clocks in Neural Health and Disease 3 Credits
Grading Scheme: Letter Grade
This course covers the molecular nature of the circadian clocks, their locations in the human body, and how they control brain function. Additional topics include the relationships between circadian clocks, sleep, and affective and neurodegenerative disorders. Students will also critically examine how circadian rhythms impact specific areas of neuroscience research.
Prerequisite: GMS6007 or consent of instructor.

GMS 6713 Neurobiol of Behav Disorders 3 Credits
Grading Scheme: Letter Grade
This course is for Masters students in the Online Biomedical Neuroscience MSc Program. This course focuses on the neurobiological of neurobehavioral disorders autism spectrum disorder, obsessive-compulsive disorder, and attention deficit hyperactivity disorder. The course will cover the clinical presentation, genetics, neuropathology, structural and functional brain changes characteristic of these disorders
Prerequisite: GMS 6007 and GMS 6705.

GMS 6715 Healthy Aging: Behavioral and Clinical Outcomes 3 Credits
Grading Scheme: Letter Grade
Examining behavioral antecedents of major diseases, by reviewing epidemiological and population-based studies of behavioral/psychosocial variables and disease conditions and decreased longevity. Focusing on behavioral interventions to modify risk for disease, including the conceptual basis for the interventions, clinical trial data supporting efficacy, and application in clinical practice.

GMS 6717 Healthy Aging in The New Millennium 3 Credits
Grading Scheme: Letter Grade
Building on the behavioral concepts of lifestyle-based intervention discussed in the Lifestyles I. We will examine the underlying physiologic changes experienced by older adults in response to lifestyle-based interventions. Adaptations will be evaluated across the spectrum of physiologic organization, from whole-body to molecular and cellular changes.

GMS 6719 Fundamentals of Computational Neuroscience 2 Credits
Grading Scheme: Letter Grade
Major concepts of neural signaling and communication from a single neuron to systems of neural ensembles, and the role of neural computation.
Prerequisite: basic knowledge of calculus and computing and/or consent of instructor.

GMS 6740 Neuromuscular Diseases 3 Credits
Grading Scheme: Letter Grade
The course addressed molecular, cellular and pathophysiological mechanisms underlying various disorders of the neuromuscular system in both model systems and clinical populations. As the majority of these disorders are without curative treatment, this course will also have a particular focus on the rationale and development of novel therapeutic strategies.
Prerequisite: This 3-credit course is open to all PhD candidates at the University of Florida. The student is highly recommended to have either taken GMS 7593 “Fundamentals of Skeletal Muscle” or consent of the instructor.

GMS 6741 Neuropathology 1 Credit, Max 8 Credits
Grading Scheme: Letter Grade
This course will focus on the histopathological evaluation of tissues using light microscopy primarily. The course will discuss neuropathological lesions in rodent models (experimental), as well as in human post-mortem tissues. Topics to be covered will vary with students' needs and interests; they will include the aging brain and neurodegenerative diseases, brain tumors, and experimental models of peripheral nerve injury, stroke and trauma.
Prerequisite: GMS 6705 Functional Human Neuroanatomy.

GMS 6750 Molecular Pathobiology of Neural Disease 1 Credit
Grading Scheme: Letter Grade
Overview of a broad range of neural disorders emphasizing genetically determined conditions.
Prerequisite: consent of instructor.

GMS 6757 Introduction to Alzheimer's Disease and Related Dementias: Clinical and Mechanistic Principles 2 Credits
Grading Scheme: Letter Grade
Designed to allow students to gain mechanistic insights into the clinical and preclinical aspects of Alzheimer's disease and related dementia.
Prerequisite: Prior knowledge of neuroscience is highly recommended. Students are expected to have at minimum a bachelors level degree in arts or sciences.

GMS 6771 Clinical Neuroscience of Aging 3 Credits
Grading Scheme: Letter Grade
Using a clinical science approach that examines the relationship between aging and change in brain systems as they relate to clinical disorders. Overviews of modern clinical neuroscience methodology, clinical assessment, intervention strategies, functional neuroanatomy, and major cognitive systems and age-related changes are provided.

GMS 6774 Pain and Aging 3 Credits
Grading Scheme: Letter Grade
Provides a common basis for students from different backgrounds and professions to learn the same language as well as a basic understanding of pain mechanisms and major biopsychosocial concepts in older adults.

GMS 6780 Addiction: Neuroscience and Trends 3 Credits
Grading Scheme: Letter Grade
Presenting findings from leading-edge neuroscience research on how different drugs act on the brain, and how differences in age, gender and other factors influence those effects. It introduces different types of drugs, and describes global trends in substance use disorders and addiction.
Prerequisite: Bachelor's degree or higher from a regionally accredited institution or equivalent

GMS 6781 Foundations in Addiction and Substance Use Disorders 3 Credits
Grading Scheme: Letter Grade
Covers cross-disciplinary areas underlying the work of addiction professionals: understanding addiction, treatment knowledge, application to practice and professional readiness. It presents models and theories of addiction, treatment and recovery; research-based diagnosis, treatment and outcome-measurement methods; sociocultural and other factors influence drug use and treatment, and practice setting differences.

GMS 6782 Addiction: Clin Eval 3 Credits
Grading Scheme: Letter Grade
Addiction: Clin Eval

GMS 6783 Addiction: Counseling and Treatment Methods 3 Credits
Grading Scheme: Letter Grade
Looks in-depth at collaboration between counselor and client in establishing treatment and recovery goals and promoting beneficial behaviors and discouraging harmful behaviors that put clients at risk for infectious diseases and other issues. It covers individual and group counseling, and counseling for families, couples and significant others.

GMS 6784 Addiction: Referral 3 Credits
Grading Scheme: Letter Grade
Addiction: Referral

GMS 6785 Addiction:Pro Ethical 3 Credits
Grading Scheme: Letter Grade
Addiction:Pro Ethical

GMS 6786 Medical Writing in Addiction 3 Credits
Grading Scheme: Letter Grade
Teaches students how to produce well-written, discipline-specific medical, and science news stories on addiction, for print, online, and broadcast media. Students will assess media coverage and controversies regarding addiciton, and learn how to simplify addiction-related scientific concepts and communicate knowledgeably, skillfully, and ethically with lay audience aabout this often-sensitive topic.
Prerequisite: Instructor permission

GMS 6787 Food Addiction, Overeating and Obesity 3 Credits
Grading Scheme: Letter Grade
Examines how relationships-- with our bodies, with other people and with food-- are linked to obesity and recovery. It also explores chemical processes behind "food addiction" and appetite, physiological processes by which food is transformed to energy and fat, current obesity treatments, and the future of obesity science.
Prerequisite: Bachelor's degree from a regionally accredited institution or equivalent

GMS 6790 New Developments in Neuroscience 2 Credits
Grading Scheme: S/U
This course will introduce students to the strategies that can be adopted that will enable them to successfully read and understand peer-reviewed papers published in the top science and neuroscience journals. By the end of the course, students will be able to apply what they learn in this course to their future efforts to read and understand scientific papers.
Prerequisite: GMS 6007 or consent of instructor.

GMS 6791 Visual Neuroscience Journal Club 1-2 Credits, Max 9 Credits
Grading Scheme: S/U
Presentation and discussion of cutting-edge research papers.
Prerequisite: 1st-year IDP core course; or consent of instructor.

GMS 6792 Neuroscience Graduate Research Seminar 1 Credit, Max 12 Credits
Grading Scheme: S/U
Critique and analysis of student-developed neuroscience projects and presentations.

GMS 6802 Health Outcomes Research for Chronic Diseases 3 Credits
Grading Scheme: Letter Grade
In-depth analysis of risk factors and health outcomes assessment for adult and childhood chronic diseases. The impact of childhood chronic conditions on adult health is emphasized. The interplay of health disparities and chronic diseases also will be discussed.
Prerequisite: GMS 6851 & Instructor Approval

GMS 6803 Data Science for Clinical Research 3 Credits
Grading Scheme: Letter Grade
Students are introduced to the broad landscape of data science for biomedical and clinical research: learn how to design and implement computerized databases for data collection, perform basic query and reporting operations, prepare databases for analytical tasks, perform quality assurance procedures, and understand basic data analytical methods and approaches.
Prerequisite: Consent of instructor.

GMS 6804 Translational Bioinformatics 3 Credits
Grading Scheme: Letter Grade
Fundamental issues of bioinformatics and how they apply to translational and clinical problems. The course is organized in 4 parts: sequence analysis, databases and ontologies, genome-wide association and linkage analysis, and networks. Each part will cover the computing and mathematical concepts used, and motivated by the actual underlying bioinformatics questions.
Prerequisite: Basic statistics or consent of instructor.

GMS 6805 Information Modeling in Biomedicine 3 Credits
Grading Scheme: Letter Grade
Introduces students to information science and knowledge representation methodologies (e.g., set theory, formal logic, etc.) for purposes of information integration. Students gain familiarity with traditional information modeling methodologies (e.g., UML) and with Semantic Web Technologies, rich in semantics for use with AI applications.

GMS 6806 Security and Privacy for Clinical Research 3 Credits
Grading Scheme: Letter Grade
Students will be introduced to a broad landscape of information security data privacy for biomedical clinical research: SP related regulations and guidelines in clinical research;concepts of computer security; analysis of a study's security plan; best practices in data management (e.g., de-identification and encryption).
Prerequisite: Instructor's Approval.

GMS 6808 GeronTechnology 3 Credits
Grading Scheme: Letter Grade
This course introduces students to the state-of-the-art concepts in technology and data science and their applications in the healthcare domain with a focus on geriatric health outcomes. Students will recognize how data science is revolutionizing the healthcare sector. Students will describe the fundamental concepts in data science and apply it to geriatric medicine. Additionally, students will summarize the perception of older adults towards the use of technology and the challenges they face.

GMS 6812 Health Outcomes Research in Cancer 3 Credits
Grading Scheme: Letter Grade
Methods and measurement issues in cancer health outcomes assessment are addressed across the continuum of cancer care - prevention, screening, diagnosis, treatment, survivorship, and end of life. Outcomes covered include survival, health-related quality of life, patient satisfaction with care, and economic burden.
Prerequisite: GMS 6851 & Instructor Approval

GMS 6813 Pragmatic Clinical Trials 3 Credits
Grading Scheme: Letter Grade
Provides students with knowledge related to designing and conducting pragmatic clinical trials, which evaluate the effectiveness of interventions and treatments in typical community and clinical care settings.
Prerequisite: PHC 6052 and (GMS 6885 or PHC 6001).

GMS 6816 Pediatric Child Health Outcomes Assessment for Clinical and Community-Based Research 2 Credits
Grading Scheme: Letter Grade
This course covers methods and measurement issues related to assessing children's health outcomes in a range of clinical and community settings. Issues such as assessing outcomes for children with special health care needs and healthy children, considerations related to growth and development, defining outcomes from parent, child and adolescent perspectives, the conduct of health risk assessments among adolescents, and implications for researchers and clinicians are presented.
Prerequisite: GMS 6851 & Instructor Approval

GMS 6818 Design and Conduct Clinical Trials I 2 Credits
Grading Scheme: Letter Grade
Scientific evaluation of health care interventions by clinical trials and the ethics, principles, and conduct of clinical trials in an epidemiological context.
Prerequisite: consent of instructor.

GMS 6819 Design and Conduct Clinical Trials II 2 Credits
Grading Scheme: Letter Grade
Complex issues in analyzing and interpreting clinical trials.
Prerequisite: consent of instructor.

GMS 6821 Measuring and Analyzing Health Outcomes I 2 Credits
Grading Scheme: Letter Grade
Focusing on measurement methods currently used in medical research and clinical settings.

GMS 6822 Measuring and Analyzing Health Outcomes II 3 Credits
Grading Scheme: Letter Grade
Cross-cultural translation, data-analysis issues, outcome measures for special populations.
Prerequisite: consent of instructor.

GMS 6826 Advanced Design and Methodology for Case-Control Studies in Clinical Research 2 Credits
Grading Scheme: Letter Grade
Providing instruction on design, critical assessment, and implementation of case-control studies. This advanced course will focus on design and methodological challenges particularly important in case control studies. Variations of the case- control study including case series, case-crossover, case-cohort, and nested case-control studies will be covered.
Prerequisite: Students are required to have taken a graduate course in health outcomes and policy prior to enrolling in the course. Students are expected to apply basic measures (Odds Ratios, Risk Ratios) and analysis techniques (logistic regression).

GMS 6827 Advanced Clinical Trial Methods 3 Credits, Max 9 Credits
Grading Scheme: Letter Grade
Statistical principles and methods used in the design and analysis of clinical trials. Rotating topics include group sequential designs, adaptive clinical trials, and Statistical Monitoring of Clinical Trials.
Prerequisite: consent of instructor.

GMS 6829 Longitudinal Research Design 2 Credits
Grading Scheme: Letter Grade
Design, evaluation, and implementation of cross-sectional and longitudinal research.
Prerequisite: a graduate course in epidemiology, a graduate course in statistics, and consent of instructor.

GMS 6830 Health Outcomes Research and Policy Development 3 Credits
Grading Scheme: Letter Grade
Focusing on the use of theoretical and applied methods to address health outcomes and policy-relevant issues, with the goal of ultimately improving people's health. This course examines health policies and their implications for health outcomes for various populations, as well as the evaluation of such policies through research. We will discuss the interconnectedness of these facets and evaluate them through the use of publications and other research conducted in this area.
Prerequisite: GMS 6800and instructor approval

GMS 6832 Economic Methods for Evaluating Value in Health 3 Credits
Grading Scheme: Letter Grade
Evaluating the relative value of health care interventions through economic methods. Foundational topics include framing the analysis, defining alternatives, techniques for eliciting patient preferences, measuring costs, and assessing outcomes. Students are exposed to cost effectiveness analysis and related methods for combining these core elements into an economic evaluation.
Prerequisite: Consent of instructor.

GMS 6833 Health Outcomes Research in Vulnerable Populations 3 Credits
Grading Scheme: Letter Grade
Policy tools used to explore how the health care system can serve vulnerable populations such as the poor, elderly, and children.
Prerequisite: consent of instructor.

GMS 6834 Health Policy and Formulation of Payment Mechanisms for Health Care 3 Credits
Grading Scheme: Letter Grade
Analytic approaches to developing payment mechanisms. Emphasizes understanding provider reimbursement in health care.
Prerequisite: consent of instructor.

GMS 6835 Health Outcomes Research in Children 3 Credits
Grading Scheme: Letter Grade
Analyzes critical issues in child health policy such as early intervention programs, new morbidities, health care, and insurance status for children in the U.S.
Prerequisite: consent of instructor.

GMS 6836 Foundations of Learning Health Systems Research 1 Credit
Grading Scheme: S/U
Provides an overview of the foundational principles required to conduct research in a learning health system environment. Students will gain introductory knowledge in Systems Science, Research and standards of Scientific Evidence, Research Methods, Informatics, Ethics and Implementation in Health Systems, Improvement and Implementation science, Engagement, and Leadership.

GMS 6841 Design and Analysis of Translational Research in Biomedical Sciences 2 Credits
Grading Scheme: Letter Grade
Common statistical analysis methods and widely used experimental design techniques including hypothesis testing, study design, confidence intervals, multiple regression, longitudinal data analysis, Non-linear regression for pharmacokinetics and pharmacodynamics, Kaplan-Meier estimates, proportional hazards models, randomization, and power analysis.

GMS 6842 Translational Research Methods 2 Credits
Grading Scheme: Letter Grade
Concepts of translational research using a multidisciplinary approach to understand research design ranging from basic science discoveries to implementation of those discoveries in clinical and community settings.
Prerequisite: consent of instructor.

GMS 6844 Time Series and Quasi-Experimental Design for Health Outcomes Research 2 Credits
Grading Scheme: Letter Grade
Research design, sampling, measurement, implementation, analysis, and interpretation for community settings.
Prerequisite: consent of instructor.

GMS 6845 Clinical & Translational Research Practicum 3 Credits
Grading Scheme: S/U
Application of clinical and/or translational research methodologies to the development of research questions and experimental design of doctoral research relevant to human health and disease.
Prerequisite: GMS 7093

GMS 6846 Meta-Analysis in Clinical, Health Services Research and Public Health 2 Credits
Grading Scheme: Letter Grade
Systematic overviews and meta-analysis techniques. Lectures and laboratory work. Develop and conduct a meta-analysis in small groups.
Prerequisite: Consent of instructor

GMS 6847 Translational Research and Therapeutics: Bench, Bedside, Community, & Policy 3 Credits
Grading Scheme: Letter Grade
Introduces and explores in-depth the multi-T-phase concept of translational research. Emphasizes moving knowledge and discovery gained from basic science research at the bench to its application in clinical and community settings and finally into national health policy. "Bench-to-bedside-to-community-to-policy."
Prerequisite: Approval by the Course Director.

GMS 6848 Ensuring Rigor and Reproducibility in Clinical and Translational Research 1 Credit
Grading Scheme: Letter Grade
Introduces best principles and practices required to conduct rigorous and reproducible research across the translational spectrum. Topics will include sound study planning and design, consideration of all relevant biomedical variables, sound data management practices, statistical considerations and techniques, and transparency in reporting research results.
Prerequisite: GMS 6861

GMS 6850 Foundations of Biomedical Informatics 3 Credits
Grading Scheme: Letter Grade
Covers foundational issues in biomedical informatics, including the unique nature of biomedical information, why biomedical information is created and used, analysis methods and inference on biomedical information, and ethical and privacy issues. Information systems and software in biomedicine and issues in implementation and use will also be covered.

GMS 6851 Fundamentals of Dissemination and Implementation Research 3 Credits
Grading Scheme: Letter Grade
An overview of principles and practices of dissemination and implementation research in the context of the translational research continuum. Content areas include the populations studied, data sources, and user audiences. Exposure to a range of dissemination and implementation research topics, and conceptual frameworks.
Prerequisite: Permission of instructor.

GMS 6852 Community Engaged Research for Clinical Effectiveness and Implementation Science Studies 2 Credits
Grading Scheme: Letter Grade
This course covers the principles and practices of clinical effectiveness and implementation science research conducted with community partners. The benefits of and barriers to conducting community engaged research will be addressed in the context of the translational research continuum. The relationships between community partner involvement and study design, data collection, and analytic methods are addressed. Additional topics include partnership development, relationships between researchers and the community, capacity building, and sustainability.
Prerequisite: GMS 6851 & Instructor Approval

GMS 6853 Improvement and Implementation Science in the Learning Health System 3 Credits
Grading Scheme: Letter Grade
This course provides a framework for examining dissemination research and implementation sciences and its applicability to clinical and community-based research. The role of dissemination research and implementation sciences in the translational research spectrum will be a key focus. Translation research involves the study of how best to transfer evidence-based knowledge into routine or representative practice, and by definition requires involvement and input of the end-user, thus a key focus will be on examining different study designs in dissemination research and implementation science, and the strengths and limitations of different methodological approaches.
Prerequisite: GMS 6851 & Instructor Approval

GMS 6854 Applied Topics in Clinical Effectiveness Research 2 Credits
Grading Scheme: Letter Grade
Clinical effectiveness research advances the translation of evidence about the effectiveness of treatments and heath care delivery strategies into practice by assessing what interventions and strategies work best for which patients and in what settings are different treatment approaches best used. This course provides an overview of the origins of clinical effectiveness research, the role of clinical effectiveness research in the translational research spectrum, and the different study designs used for conducting clinical effectiveness research. Case studies, guest lectures by faculty engaged in clinical effectiveness research, and other applied approaches will be used.
Prerequisite: GMS 6851 & Instructor Approval

GMS 6855 Medical Writing in Psychiatry 3 Credits
Grading Scheme: Letter Grade
Teaches students how to produce well-written, discipline-specific medical/science news stories on psychiatric disorders, for print, online and broadcast media. Students will assess media coverage and controversies regarding psychiatric disorders, and learn how to simplify scientific concepts and communicate knowledgeably, skillfully and ethically with lay audiences about the topic.
Prerequisite: Instructor permission

GMS 6856 Introduction to Biomedical Natural Language Processing 3 Credits
Grading Scheme: Letter Grade
Introduces the basic knowledge of natural language processing (NLP), examine methods, systems, and ontologies/resources in the biomedical domain. Students will gain necessary skills to process biomedical text, apply state-of-the-art NLP systems and handle biomedical NLP tasks such as Information Extraction and Word Sense Disambiguation.
Prerequisite: Experience of computer programing, such as python for data processing.

GMS 6857 Clinical Decision Support Systems 3 Credits
Grading Scheme: Letter Grade
Introduces students to fundamentals of clinical decision-making systems and software. Students learn underlying mathematics of decision theory and decision-making, managing risk and uncertainty, pattern recognition and machine learning in decision-making. Students explore usability of clinical decision support systems, patient-centered approaches, implementation science and how systems are integrated with EHR and clinical workflows and their impact on care access and quality of care.

GMS 6861 Applied Biostatistics I 3 Credits
Grading Scheme: Letter Grade
Basic probability and distribution concepts and statistical analysis methods, including descriptive measures, point estimation, hypothesis testing (e.g., t test, analysis of variance, chi-square test etc.), confidence interval, simple linear regression and some nonparametric methods. SPSS will be used for basic statistical analyses.
Prerequisite: Consent of Department.

GMS 6865 Quantitative Literacy for Translational Research 2 Credits
Grading Scheme: Letter Grade
Designed to give beginning translational researchers without background an overview of the quantitative skills needed to 1) understand what constitutes useful research data, 2) organize research data, 3) use statistical software to analyze research data, and 4) organize and present research data in meaningful ways.
Prerequisite: Undergraduate Statistics course or Graduate Introduction to Statistics course or instructor permission.

GMS 6867 Big Data for the Biologist 3 Credits
Grading Scheme: Letter Grade
Designed for biology graduate students who wish to be able to analyze their own large scale omics or multi omics data. This class teaches the foundational knowledge needed to understand those analyses. The class is fast paced and demanding.
Prerequisite: Calculus 2.

GMS 6873 Introduction to Medical Bioethics 3 Credits
Grading Scheme: Letter Grade
Reviewing the impact of bioethics in medical practice and research. It delves into topics such as stem cell research, reproductive rights, privacy laws, humans as research subjects, cultural and religious considerations in medical decision-making, and the role of government vs. the rights of individuals.
Prerequisite: Bachelor's degree from an accredited regional institution or equivalent.

GMS 6874 Medicine and the Law 3 Credits
Grading Scheme: Letter Grade
Medicine and the Law

GMS 6875 Ethical and Policy Issues in Clinical Research 2 Credits
Grading Scheme: Letter Grade
Ethical and policy issues relating to conduct of clinical research. Basic understanding of regulations governing research on human subjects. Introduction to the topic of research with animals.

GMS 6876 Law & Ethics of Aging 3 Credits
Grading Scheme: Letter Grade
Providing an overview of the legal and ethical challenges that our aging society and their caregivers (whether family members, health care providers, or others) face as well as a framework for analyzing these challenges.

GMS 6880 Mentored Research Hop 3 Credits
Grading Scheme: Letter Grade
Mentored Research Hop

GMS 6881 Special Studies in Epidemiology and Health Policy Research 2 Credits, Max 4 Credits
Grading Scheme: S/U
Advanced or specialized topic in epidemiology or health policy with the approval of the instructor.
Prerequisite: GMS 6800; consent of instructor.

GMS 6883 Practicum Experience in Epidemiology and Health Policy 2 Credits
Grading Scheme: S/U
Student selects a state or federal health agency or research project in epidemiology and health policy with instructor approval.
Prerequisite: GMS 6800 or consent of instructor.

GMS 6884 Research in Epidemiology and Health Policy 2 Credits
Grading Scheme: Letter Grade
Individual, approved research topic or project in epidemiology and health policy.
Prerequisite: GMS 6800, consent of instructor.

GMS 6885 Translational Health Research Design 3 Credits
Grading Scheme: Letter Grade
This course will provide students with an overview of the research designs common in translational health research, a foundational understanding of a variety of research designs including the creation of defensible and meaningful hypotheses, bias potential, strengths, and limitations.
Prerequisite: Graduate level statistics course or instructor approval.

GMS 6888 Mentored Research Hop 3 Credits
Grading Scheme: Letter Grade
Mentored Research Hop

GMS 6889 Systematic Review Methods 3 Credits
Grading Scheme: Letter Grade
Examines the science and rigorous methodology of conducting a systematic review using the PRISMA guidelines. Systematic reviews are considered one of the highest levels of evidence quality and are important studies in their own right. Students will finish the course as critical consumers of systematic reviews and equipped with the skills to produce a systematic review, which is more likely to be publishable as a stand-alone paper than a narrative review.
Prerequisite: Instructor approval.

GMS 6893 Clinical and Translational Science Seminar Series 2 Credits, Max 6 Credits
Grading Scheme: Letter Grade
Researchers discuss clinical, laboratory, epidemiologic, and economic aspects of a given topic; also, intervention strategies and community outreach activities. Exposure to faculty who may be available for Clinical Preceptorship assignments. Topics rotate every 2 weeks.
Prerequisite: consent of instructor.

GMS 6895 CTS Journal Club 1 Credit, Max 3 Credits
Grading Scheme: S/U
Rotating topics include the presentation and critical discussion of recent, original papers about clinical and/or translational research relevant to human health and disease.
Prerequisite: GMS 7093

GMS 6896 Health Outcomes and Policy Seminar 1 Credit
Grading Scheme: Letter Grade
Providing a forum for students and faculty to critically evaluate cutting-edge research and methodology and discuss the implications for their own research through interactive seminar series. Both recently published research and research in progress are evaluated.
Prerequisite: Permission of instructor.

GMS 6903 Manuscript and Abstract Writing for Clinician/Scientists 2 Credits
Grading Scheme: Letter Grade
Didactic and interactive sessions to improve the quality of manuscript and abstract writing.
Prerequisite: consent of instructor.

GMS 6905 Independent Studies in Medical Sciences 1-10 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Independent Studies in Medical Sciences

GMS 6910 Supervised Research 1-5 Credits, Max 5 Credits
Grading Scheme: S/U
Supervised Research

GMS 6920 Genetics Journal Colloquy 1 Credit, Max 12 Credits
Grading Scheme: S/U
Critical presentations and discussions of recent original articles.
Prerequisite: consent of instructor.

GMS 6921 Immunology/Microbiology Journal Colloquy 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
Critical presentations and discussions of recent original articles.
Prerequisite: GMS 6001, GMS 6006 , or consent of instructor.

GMS 6934 Cancer Biology Data Discussion 1 Credit
Grading Scheme: Letter Grade
Research reports and discussions of current Cancer Biology research performed by graduate students, faculty, and invited speakers.

GMS 6940 Supervised Teaching 1-5 Credits, Max 5 Credits
Grading Scheme: S/U
Supervised Teaching

GMS 6943 Master's Translational Biotechnology Internship 3 Credits
Grading Scheme: S/U
Summer Internship in Translational Biotechnology at a Biotechnology company (Florida-based preferred). Exposure to and participation in product development, regulatory compliance, business, science, medicine, manufacturing, and quality systems.
Prerequisite: GMS 6971

GMS 6945 Team Science 1 Credit
Grading Scheme: Letter Grade
Addressing today's complex research and societal problems requires integration of specialized knowledge bases and cross-disciplinary collaboration. This course offers practical guidance about engaging in Team Science to pursue complex research questions, work effectively with team members, and assess team performance in order to produce high impact research outcomes.
Prerequisite: Graduate standing.

GMS 6951 Teaching Biomedical Science 2 Credits
Grading Scheme: Letter Grade
Acquire the skills necessary for creating and modifying courses through a combination of self-awareness activities and information drawn from the field of curriculum that informs teaching across content areas. Learning skills to write a teaching philosophy, draft components of their own course syllabus,add these components to their portfolio. Learning platform-online;Canvas

GMS 6952 Curricular Models for Biomedical Science 3 Credits
Grading Scheme: Letter Grade
Students are introduced to various models of teaching and instructional strategies. Models of teaching give instructors the tools they need to build strong learning environments and interactions that accelerate learning. Models provide a blueprint, structure, direction for teaching. Students will learn to develop curriculum,analyze structure and identify the teaching models.

GMS 6953 Art and Science of Mentoring 1 Credit
Grading Scheme: Letter Grade
Learn to mentor other professionals who are in early stages of career development. Develop knowledge and skills through provision of didactic information and experiential learning activities. Complete an individual development plan, identify ethical dilemmas in mentoring and describe strategies to prevent them, and articulate their own mentoring philosophy.

GMS 6954 Assessing Effectiveness of Biomedical Science Teaching and Curricula 3 Credits
Grading Scheme: Letter Grade
Overview of the models of evaluation within contrasting paragims as it relates to biomedical science education. Topics address concerns while adhering to the professional, scholarly and ethical roles the evaluator must uphold. Develop rubrics, select assessments, use peer observations for assessment of teaching methods, products and outcomes in clinics/laboratories,learning environments.

GMS 6971 Research for Master's Thesis 1-15 Credits
Grading Scheme: S/U
Research for Master's Thesis

GMS 6975 Team Science 1 Credit
Grading Scheme: Letter Grade
Team Science

GMS 7093 Introduction to Clinical and Translational Research 2 Credits
Grading Scheme: Letter Grade
Design, management, measurement, and study limitations for research in the clinical setting.
Prerequisite: Consent of APPCI program.

GMS 7122 Advanced Tropical Medicine 3 Credits
Grading Scheme: Letter Grade
Advanced Tropical Medicine
Prerequisite: GMS 6121 & PHC 6001 or equivalents

GMS 7133 Advanced Molecular Virology 2 Credits
Grading Scheme: Letter Grade
Advanced Molecular Virology
Prerequisite: GMS 6121 or equivalent

GMS 7191 Research Conference 1 Credit, Max 12 Credits
Grading Scheme: S/U
Critical discussion and appraisal of research programs of faculty and students of the department.

GMS 7192 Journal Colloquy 1 Credit, Max 12 Credits
Grading Scheme: Letter Grade
An online course in which primary research papers in medical microbiology (virology, bacteriology, mycology, and parasitology) are assigned for reading and analysis on a weekly basis. A homework quiz and bulletin board-type discussion are assigned for each paper to help students understand and demonstrate mastery of the material.

GMS 7194 Biotechnology Seminar 1-2 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Given concurrently with BCH 7410. Presentations related to biotechnology industry by outside speakers and students.
Prerequisite: Prereq or coreq: Molecular Biology.
Corequisite: undefined

GMS 7593 Topics in Pharmacology and Toxicology 1-3 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Seminars, informal conferences, or laboratory work on selected topics.

GMS 7794 Neuroscience Seminar 1 Credit, Max 12 Credits
Grading Scheme: S/U
Research seminars given by local, national, and occasionally international speakers.

GMS 7795 Special Topics in Neuroscience 1-4 Credits, Max 12 Credits
Grading Scheme: Letter Grade
Specialized subjects in the neurosciences and allied disciplines. Current topics include biological imaging techniques, fundamentals of computational neuroscience, graduate research seminar series, write clubs, scientific communication workshop (Whitney Lab), and electrophysiological journal club (Whitney Lab).

GMS 7858 Causal Artificial Intelligence for Health Research 3 Credits
Grading Scheme: Letter Grade
This course covers foundational issues in “causal Artificial Intelligence” embedding machine learning with causal inference methods on real-world data, and methodologies for automated causal learning. Health research approaches such as target trials and transportability will be discussed, as well as Artificial Intelligence fairness to tackle health disparities and inequity.
Prerequisite: Instructor approval.GMS7858

GMS 7866 Principles of Referent Tracking in Biomedical Informatics 3 Credits
Grading Scheme: Letter Grade
Provides an in-depth exploration of the purpose, scope, technical structures; uses of Referent Tracking as a methodology to design information systems that are maximally self-explanatory and explicit in terms of the data they manage and self-aware in terms of their interactions with other systems and users thereof.
Prerequisite: GMS 6850 & GMS 6803 & GMS 6804 & GMS6805

GMS 7877 Responsible Conduct of Biomedical Research 1 Credit
Grading Scheme: Letter Grade
Key issues in the responsible conduct of biomedical research, following the research process from inception to planning, conducting, reporting, and reviewing biomedical research.
Prerequisite: GMS 6001 or consent of instructor.

GMS 7886 Health Outcomes and Policy PhD Seminar: Applied Research 3 Credits
Grading Scheme: Letter Grade
This course builds on students' knowledge of health outcomes theory, research design and methods with an applied focus. Students critically evaluate research with faculty who have successfully implemented health outcomes research in biomedical, clinical, and community settings. Students develop research questions, hypotheses, and study protocols in preparation for independent research.
Prerequisite: GMS 6885, GMS 6861, GMS 6862, and instructor approval. One of: GMS 6826, GMS 6829, GMS 6832, GMS 6844, or GMS 6846

GMS 7887 Health Outcomes & Policy PhD Research Seminar 1 Credit
Grading Scheme: S/U
Seminar series where advanced PhD students will meet to present, critically appraise, and discuss current research in the health outcomes and policy academic literature as well as the research programs of HOP faculty and graduate students.
Prerequisite: Instructor approval.

GMS 7906 Grant Writing for Health Outcomes Studies 2 Credits
Grading Scheme: Letter Grade
Students learn grant writing basics, with focus on submissions to NIH, AHRQ, and PCORI. Specific aims, significance, hypotheses are developed, culminating in production of a grant proposal draft during the semester. Other topics covered include biosketch development, budget preparation/ justification, sample size justification, and navigation of funding opportunities.
Prerequisite: GMS 6851 and GMS 6885 and instructor approval.

GMS 7944 Practicum in Biomedical Science Education 3 Credits
Grading Scheme: S/U
Teach biomedical science and/or biotechnology (supervised by a professor) at summer workshops for high school students and teachers.
Prerequisite: GMS 7950.

GMS 7950 Fundamentals of Biomedical Science Education 2 Credits
Grading Scheme: Letter Grade
Overview of educational issues faced by biomedical scientists teaching at the undergraduate, graduate, or professional level. Practical guidelines most relevant for beginning biomedical science educators, including teaching skills and strategies and the underlying theory of learning and teaching.
Prerequisite: consent of instructor.

GMS 7979 Advanced Research 1-12 Credits
Grading Scheme: S/U
Research for doctoral students before admission to candidacy. Designed for students with a master's degree in the field of study or for students who have been accepted for a doctoral program. Not appropriate for students who have been admitted to candidacy.

GMS 7980 Research for Doctoral Dissertation 1-15 Credits
Grading Scheme: S/U
Research for Doctoral Dissertation