

MEDICAL SCIENCES

Program Information

Dean: M. L. Good

Associate Dean for Graduate Education: Thomas Rowe

Complete faculty listing: Follow this link (<http://gradschool.ufl.edu/GimsPublic/Acalog/Faculty.aspx>).

The College of Medicine offers training opportunities leading to either the Doctor of Philosophy or Master of Science degree in medical sciences. Minimum requirements for these degrees are given in the General Information section of this catalog. The interdisciplinary program (IDP) in biomedical sciences is the major focus leading to the Doctor of Philosophy degree. Other graduate courses and programs are listed under departmental headings.

Interdisciplinary Program (IDP) in Biomedical Sciences

The goal of the IDP is to prepare students for a diversity of careers in research and teaching in academic and commercial settings, after completion of the Ph.D. in Medical Sciences. The program provides a modern, comprehensive graduate education in biomedical sciences while providing both maximum program flexibility and appropriate specialization for advanced training. The IDP represents a cooperative effort of six interdisciplinary advanced concentrations with participation of over 250 faculty members.

During the first semester of study, students undertake a common, comprehensive interdisciplinary core curriculum of classroom study and a responsible conduct of research course. During the second semester, students begin to focus their coursework in one or two concentrations. Throughout the first two semesters, students participate in at least three laboratory rotations in any of the laboratories of the IDP faculty members. The advanced concentration and the supervisory committee chair are chosen no later than the end of the spring semester to maximize flexibility and facilitate an informed decision. Students entering the advanced concentrations take more specialized courses that strengthen their knowledge of these disciplines. The advanced concentration curricula are flexible enough to allow students to integrate course work offered in other advanced concentrations. In addition, journal clubs and seminars associated with their research interests allow students to further augment their scientific development.

Prospective students should have strong backgrounds in biology including genetics, chemistry (organic, quantitative, and biochemistry), physics, and calculus. Demonstrated high motivation and a serious intention to pursue research-related careers are also important considerations. This is best accomplished by performing independent study in a research laboratory for at least a semester, with a year or more being preferred. For more information, write:

IDP
P.O. Box 100229
College of Medicine
Gainesville, FL 32610-0229

For expanded information about the IDP, visit <http://biomed.med.ufl.edu/>.

Advanced Concentration in Biochemistry and Molecular Biology

Directors: Robert McKenna and Kevin Brown

The Graduate Faculty of the biochemistry and molecular biology advanced concentration share an interest in the relationships between the structure of a biological macromolecule and the function of that molecule in the cell. The structure (encoded ultimately by the genome) sets the phenotype of the organism. The uniting theme among the Graduate Faculty is their approach to research: Each uses the techniques of biochemistry and molecular biology/genetics to characterize the function of a macromolecule and show how function (and the process it is part of) is determined by the structure of that molecule and its interactions with other macromolecules. Specific research directions range from physical determination of the molecular structure of proteins to regulation of cellular processes to the genetic mapping of disease loci.

For information about other programs and courses in this field, see the Department of Biochemistry and Molecular Biology (<http://catalog.ufl.edu/graduate/colleges-departments/medicine/biochemistry-molecular/>) listing.

Advanced Concentration in Cancer Biology

Directors: Dietmar Siemann and Maria Zajac-Kaye

The Cancer Biology Concentration (CBC) provides training opportunities in cancer research ranging from basic to translational. The program spans many disciplines, including molecular and cell biology, genetics and epigenetics, biochemistry, microbiology, pharmacology, anatomy, pathology, epidemiology, bioinformatics, immunology and many others involved in the understanding of the development, progression, dissemination, and treatment of cancer.

Students in the will have opportunities to work with outstanding cancer investigators in state of the art facilities. Through combinations of courses, seminars, small group discussions, and an interdisciplinary approach to research, the program allows students to gain a unique understanding of cancer and to build a firm foundation upon which they can build careers in academia, government, and biotech and pharmaceutical industry.

For more information please see our website: <http://idp.med.ufl.edu/about/cancer-biology-concentration> (<http://idp.med.ufl.edu/about/cancer-biology-concentration/>)

Advanced Concentration in Clinical and Translational Science

Director: Wayne McCormack

The Clinical & Translational Science PhD program provides graduate students with knowledge and skills required to develop a career in multidisciplinary clinical and translational research. This program uses a team-science approach to provide didactic training and mentoring for predoctoral students performing clinical and/or translational research in health-related fields at UF. Completion of program requirements results in the award of an interdisciplinary concentration in Clinical & Translational Science. Doctoral students from all UF doctoral graduate programs who are interested in health-related research are eligible to apply.

For more information contact:

Susan Gardner
Program Coordinator
sgard@ufl.edu

Dr. Wayne McCormack
Program Director

mccormac@ufl.edu

<https://www.ctsi.ufl.edu/education/ph-d-students/>

Advanced Concentration in Genetics

Director: M. R. Wallace
Co-Director: Lei Zhou

The concentration in genetics offers graduate training in all facets of modern molecular genetics including bacterial, viral, lower eukaryotic, mouse, developmental, and human genetics. The courses listed are taught in a 5-week modular format, ranging from 1-3 modules.

Advanced Concentration in Health Outcomes and Policy

The University of Florida's Master of Science in Medical Sciences, with a concentration in Health Outcomes and Policy, is a specialized degree designed to put its graduates at the forefront of innovative research to develop, implement, and evaluate clinical and community-based programs that promote health and health outcomes. Throughout the curriculum, special emphasis is placed on health disparities and vulnerable populations. In addition to traditional graduate students, our program is available to medical students, post-doctoral researchers, fellows, residents, Ph.D. students, and junior faculty.

We also offer a 16-credit graduate certificate designed to complement other concurrent courses of study and to provide continuing education opportunities for faculty. The certificate can be completed in one year on a part-time basis.

Advanced Concentration in Immunology and Microbiology

Directors: C. E. Mathews and Scott Tibbetts

The concentration in immunology and microbiology offers graduate training in cellular and molecular immunology (including immunopathology, immunogenetics, and autoimmunity) and in microbiology (including virology, bacteriology, microbial genetics, and microbial pathogenesis). The courses listed are taught in a 5-week modular format, ranging from 1-3 modules.

Advanced Concentration in Molecular Cell Biology

Director: Alexander Ishov
Co-Director: Eric Vitriol

The advanced concentration in molecular cell biology (MCB) prepares investigators for careers in biomedical research in academic or industrial settings. This multidisciplinary specialization has more than 50 participating faculty members and offers an extraordinary range of opportunities for advanced study of life at the molecular and cellular levels. The Graduate Faculty share common interests in the molecular interactions that account for functionally integrated subcellular, cellular, and tissue organization found in living organisms. The model systems in use range from yeast and cellular slime molds through *Drosophila* to birds and mammals. These systems are manipulated and analyzed using a wide range of powerful molecular, genetic, protein chemical, immunological, pharmacological, nuclear magnetic resonance (NMR), and microscopic imaging strategies. Students who select MCB take advanced course work and initiate independent research during the second year. This approach provides broad-based vision early in the program and the appropriate degree of specialization later on.

Advanced Concentration in Neuroscience

Directors: Jada Lewis and Harry Nick

The Graduate Faculty associated with the neuroscience advanced concentration have expertise in neuroanatomy, molecular and cellular neurobiology, neurodevelopment and aging, neurotransmitter chemistry and pharmacology, neuroendocrinology and neuroimmunology, cellular and molecular neuro-oncology, cellular and membrane neurophysiology, somatosensory and motor systems, transplantation neurobiology, injury and repair of the CNS, and neurobehavioral sciences. Study in marine vertebrate and invertebrate neurobiology is available through Graduate Faculty at the Whitney Laboratory.

Advanced Concentration in Oral Biology

Chair: R. A. Burne
Graduate Coordinator: J. Brady

The Department of Oral Biology, a unit of the College of Dentistry, offers graduate study leading to the degree of Doctor of Philosophy as part of the College of Medicine's Interdisciplinary Program (IDP) in Biomedical Sciences. The work is designed to provide the degree candidate with a strong background in basic biological principles relevant to the various subspecialties of oral biology, as well as specialized training in various aspects of the diseases and disorders of the oral cavity.

Areas of emphasis include application of microbiological, immunological, cellular, and molecular biological concepts and technologies to answer questions about host-pathogen interactions in oral disease; vaccine development; oral microbial physiology; oral bacterial biofilm biology; saliva and salivary gland biology; microbial antibiotic resistance; and autoimmune diseases. More information is available at <http://dental.ufl.edu/departments/oral-biology/>.

Prerequisites for admission in addition to those of the Graduate School include a broad base of courses in mathematics, physics, organic and analytic chemistry, advanced biology, biochemistry, molecular biology, and statistical methods. Specific requirements can be obtained from the Graduate Coordinator or the IDP office.

Advanced Concentration in Physiology and Pharmacology

Directors: Gonzalo Torres and Glenn Walter

The Graduate Faculty associated with this advanced concentration have expertise in a variety of disciplines, including molecular and cellular biology, pharmacology, physiology, neuroscience, and biochemistry. These faculty bring together unique strengths to provide the students with diverse training. Students may train in laboratories involved in cardiovascular, neuro, endocrine, and developmental physiology; pharmacology; and toxicology. Students conduct research at the molecular, cellular, and integrative levels. Many of the faculty are involved in multidisciplinary, collaborative research efforts that aim to understand basic physiological mechanisms and pathophysiological processes (e.g., cardiovascular, neurodegenerative, and neoplastic diseases).

Other Interdisciplinary Doctoral Concentrations Offered

The interdisciplinary emphasis on vision sciences is also discussed in the Interdisciplinary Graduate Studies section. The program director is:

Dr. W. Clay Simith
P.O. Box 100284
College of Medicine
Gainesville, FL 32610

or (352) 392-0476.

Interdisciplinary study in toxicology is coordinated by the Center for Environmental and Human Toxicology and is concerned with the effects of chemicals on human and animal health. Additional information is given in the Interdisciplinary Graduate Studies section of this catalog or may be obtained from the codirector.

Dr. Colin Sumners
 P.O. Box 100215
 College of Medicine
 Gainesville, FL 32610
 or (352) 392-0740.

Degrees Offered

Degrees Offered with a Major in Medical Sciences

- Doctor of Philosophy
 - without a concentration
 - concentration in Biochemistry and Molecular Biology
 - *optional second concentration in Clinical and Translational Science*
 - *optional second concentration in Health Outcomes and Implementation Science*
 - concentration in Biomedical Informatics
 - concentration in Cancer Biology
 - *optional second concentration in Clinical and Translational Science*
 - concentration in Clinical and Translational Science
 - *optional second concentration in Health Outcomes and Implementation Science*
 - concentration in Genetics
 - *optional second concentration in Clinical and Translational Science*
 - *optional second concentration in Health Outcomes and Implementation Science*
 - concentration in Health Outcomes and Implementation Science
 - *optional second concentration in Clinical and Translational Science*
 - concentration in Imaging Science and Technology
 - concentration in Immunology and Microbiology
 - *optional second concentration in Clinical and Translational Science*
 - *optional second concentration in Health Outcomes and Implementation Science*
 - concentration in Medical Physics
 - concentration in Molecular Cell Biology
 - *optional second concentration in Clinical and Translational Science*
 - *optional second concentration in Health Outcomes and Implementation Science*
 - concentration in Neuroscience
 - *optional second concentration in Clinical and Translational Science*
 - *optional second concentration in Health Outcomes and Implementation Science*
 - concentration in Pharmacology & Therapeutics
 - *optional second concentration in Clinical and Translational Science*
- Master of Science
 - without a concentration
 - concentration in Aging and Geriatric Practice
 - concentration in Biomedical Informatics
 - concentration in Biomedical Neuroscience
 - concentration in Forensic Medicine
 - concentration in Genetics and Genomics
 - concentration in Gerontology
 - concentration in Health Outcomes and Implementation Science
 - concentration in Medical Physics
 - concentration in Medical Physiology and Pharmacology
 - concentration in Molecular Cell Biology
 - concentration in Neuroscience
 - concentration in Pharmacology
 - concentration in Translational Biotechnology

Requirements for these degrees are given in the Graduate Degrees (<http://catalog.ufl.edu/graduate/degrees/>) section of this catalog.

Courses

Core Courses-IDP

Code	Title	Credits
GMS 6001	Fundamentals of Biomedical Sciences I	5
GMS 6003	Fundamentals of Graduate Research and Professional Development	1
GMS 6004	IDP Practical Laboratory	2
GMS 6007	Fundamentals of Neuroscience	3
GMS 6008	Fundamentals of Physiology and Functional Genomics	2
GMS 6009	Principles of Drug Action and Therapeutics	3
GMS 6065	Fundamentals of Cancer Biology	3
GMS 6090	Research in Medical Sciences	1-10
GMS 7877	Responsible Conduct of Biomedical Research	1
GMS 7593	Topics in Pharmacology and Toxicology	1-3

General and Advanced Courses

Code	Title	Credits
GMS 5905	Special Topics in Biomedical Sciences	1-4
GMS 6090	Research in Medical Sciences	1-10
GMS 6622	Mitochondrial Biology in Aging and Disease	2
GMS 6905	Independent Studies in Medical Sciences	1-10
GMS 6910	Supervised Research	1-5
GMS 6875	Ethical and Policy Issues in Clinical Research	2
GMS 6940	Supervised Teaching	1-5
GMS 6971	Research for Master's Thesis	1-15
GMS 7950	Fundamentals of Biomedical Science Education	2
GMS 7944	Practicum in Biomedical Science Education	3
GMS 7877	Responsible Conduct of Biomedical Research	1
GMS 7979	Advanced Research	1-12
GMS 7980	Research for Doctoral Dissertation	1-15

Advanced Concentration Courses

Advanced Concentration in Biochemistry and Molecular Biology Courses

Code	Title	Credits
BCH 6040	Research Discussion in Biochemistry and Molecular Biology	1
BCH 6107		1
BCH 6206	Advanced Metabolism	3
BCH 6207	Advanced Metabolism: Role of Membranes in Signal Transduction and Metabolic Control	1
BCH 6208	Advanced Metabolism: Regulation of Key Reactions in Carbohydrate and Lipid Metabolism	1
BCH 6209	Advanced Metabolism: Regulation of Key Reactions in Amino Acid and Nucleotide Metabolism	1
BCH 6415	Advanced Molecular and Cell Biology	3
BCH 6740	Physical Biochemistry/Structural Biology	3
BCH 6741C	Magnetic Resonance Imaging and Spectroscopy in Living Systems	1-3
BCH 6744	Molecular Structure Determination by X-ray Crystallography	1
BCH 6745	Molecular Structure and Dynamics of NMR Spectroscopy	1
BCH 6746	Structural Biology: Macromolecular Structure Determination	1
BCH 6747	Structural Biology/Advanced Physical Biochemistry: Spectroscopy and Hydrodynamics	1
BCH 6749C	Numerical Methods in Structural Biology	1
BCH 6876	Recent Advances in Membrane Biology	1
BCH 6877	Recent Advances in Structural Biology	1
BCH 6878	Recent Advances in Cytoskeletal Processes	1
BCH 6936	Biochemistry Seminar	1
BCH 7410	Advanced Gene Regulation	1
BCH 7412	Epigenetics of Human Disease and Development	1
BCH 7515	Structural Biology/Advanced Physical Biochemistry: Kinetics and Thermodynamics	1
GMS 6195	Epigenetics Journal Club	1

Advanced Concentration in Cancer Biology Courses

Code	Title	Credits
BCH 5413	Mammalian Molecular Biology and Genetics	3
BCH 7410	Advanced Gene Regulation	1
BCH 7412	Epigenetics of Human Disease and Development	1
GMS 5905	Special Topics in Biomedical Sciences	1-4
GMS 6009	Principles of Drug Action and Therapeutics	3
GMS 6053	Cancer Biology and Therapeutics	1
GMS 6061	Nuclear Structure and Dynamics	1
GMS 6064	Tumor Biology	1
GMS 6065	Fundamentals of Cancer Biology	3
GMS 6090	Research in Medical Sciences	1-10
GMS 6232	Advanced Applications of Bioinformatics in Genetics	1
GMS 6335	Advanced Stem Cell Biology: Tissue Engineering	1
GMS 6338	Recent Advances in Cancer Metastasis	1
GMS 6421	Cell Biology	4

GMS 6647	Transcriptional and Translational Control of Cell Growth and Proliferation	1
GMS 6683	Fundamentals of Vascular Physiology and Pathology	2
GMS 6691	Special Topics in Cell Biology and Anatomy	1-4
GMS 6812	Health Outcomes Research in Cancer	3
GMS 6818	Design and Conduct Clinical Trials I	2
PHC 6937	Special Topics in Public Health	1-6

Advanced Concentration in Genetics Courses

Code	Title	Credits
BCH 7410	Advanced Gene Regulation	1
GMS 6012	Human Genetics	1
GMS 6013	Developmental Genetics	1
GMS 6014	Applications of Bioinformatics to Genetics	1
GMS 6015	Human Genetics II	1
GMS 6034	Advanced Virology I: Genetics and RNA	1
GMS 6038	Bacterial Genetics and Physiology	1
GMS 6151		1
GMS 6153	Advanced Bacterial Genetics	1
GMS 6155		1
GMS 6195	Epigenetics Journal Club	1
GMS 6231	Genomics and Bioinformatics	3
GMS 6232	Advanced Applications of Bioinformatics in Genetics	1
GMS 6290	Genetics/Genomics Program Graduate Seminar	1
GMS 6506	Biologic Drug Development	1
GMS 6920	Genetics Journal Colloquy	1
GMS 7192	Journal Colloquy	1

Advanced Concentration in Health Outcomes and Implementation Science Courses

Code	Title	Credits
GMS 5905	Special Topics in Biomedical Sciences	1-4
GMS 6802	Health Outcomes Research for Chronic Diseases	3
GMS 6803	Data Science for Clinical Research	3
GMS 6804	Translational Bioinformatics	3
GMS 6812	Health Outcomes Research in Cancer	3
GMS 6816	Pediatric Child Health Outcomes Assessment for Clinical and Community-Based Research	2
GMS 6821	Measuring and Analyzing Health Outcomes I	2
GMS 6822	Measuring and Analyzing Health Outcomes II	3
GMS 6826	Advanced Design and Methodology for Case-Control Studies in Clinical Research	2
GMS 6829	Longitudinal Research Design	2
GMS 6830	Health Outcomes Research and Policy Development	3
GMS 6832	Economic Methods for Evaluating Value in Health	3
GMS 6833	Health Outcomes Research in Vulnerable Populations	3
GMS 6834	Health Policy and Formulation of Payment Mechanisms for Health Care	3
GMS 6835	Health Outcomes Research in Children	3
GMS 6842	Translational Research Methods	2
GMS 6844	Time Series and Quasi-Experimental Design for Health Outcomes Research	2
GMS 6846	Meta-Analysis in Clinical, Health Services Research and Public Health	2

GMS 6851	Fundamentals of Dissemination and Implementation Research	3
GMS 6852	Community Engaged Research for Clinical Effectiveness and Implementation Science Studies	2
GMS 6853	Improvement and Implementation Science in the Learning Health System	3
GMS 6854	Applied Topics in Clinical Effectiveness Research	2
GMS 6881	Special Studies in Epidemiology and Health Policy Research	2
GMS 6883	Practicum Experience in Epidemiology and Health Policy	2
GMS 6884	Research in Epidemiology and Health Policy	2
GMS 6885	Translational Health Research Design	3
GMS 6893	Clinical and Translational Science Seminar Series	2
GMS 6896	Health Outcomes and Policy Seminar	1
GMS 7866	Principles of Referent Tracking in Biomedical Informatics	3

Advanced Concentration in Immunology and Microbiology Courses

Code	Title	Credits
VME 6505	Autoimmunity	1
GMS 6034	Advanced Virology I: Genetics and RNA	1
GMS 6035	Advanced Virology II: RNA Viruses	1
GMS 6036	Molecular Virology III: DNA Viruses	1
GMS 6038	Bacterial Genetics and Physiology	1
GMS 6040	Host-Pathogen Interactions	1
GMS 6121	Infectious Diseases	3
GMS 6140	Principles of Immunology	4
GMS 6193	Research Conference in Oral Biology	1-3
GMS 6196	Virology Journal Club	1
GMS 6198	Bacterial Pathogenesis Journal Club	1
GMS 6337	B Cell Development in Health and Disease	1
GMS 6382	Special Topics in Immunology	1-3
GMS 6921	Immunology/Microbiology Journal Colloquy	1
GMS 7192	Journal Colloquy	1
VME 6934	Topics in Veterinary Medical Sciences	1-4

Advanced Concentration in Molecular Cell Biology Courses

Code	Title	Credits
GMS 5905	Special Topics in Biomedical Sciences	1-4
GMS 6013	Developmental Genetics	1
GMS 6061	Nuclear Structure and Dynamics	1
GMS 6062	Protein Trafficking	1
GMS 6063	Cell Biology of Aging	1
GMS 6064	Tumor Biology	1
GMS 6065	Fundamentals of Cancer Biology	3
GMS 6331	Stem Cell Biology	1
GMS 6335	Advanced Stem Cell Biology: Tissue Engineering	1
GMS 6336	Advanced Stem Cell Biology: Regenerative Medicine	1
GMS 6417	Integrative Aging Physiology	3
GMS 6421	Cell Biology	4
GMS 6622	Mitochondrial Biology in Aging and Disease	2
GMS 6635	Organization of Cells and Tissues	3

GMS 6647	Transcriptional and Translational Control of Cell Growth and Proliferation	1
GMS 6690	Molecular Cell Biology Journal Club	1
GMS 6691	Special Topics in Cell Biology and Anatomy	1-4
GMS 6692	Research Conference in Anatomy and Cell Biology	1

Advanced Concentration in Neuroscience Courses

Code	Title	Credits
GMS 6021	Principles of Neuroscience I: Organization and Development of the Nervous System	2
GMS 6022	Principles of Neuroscience II: Cellular and Molecular Neuroscience	3
GMS 6023	Principles of Neuroscience III: Molecular Neuropharmacology and its Clinical Application	2
GMS 6029	Brain Journal Club	1
GMS 6052	Ion Channels of Excitable Membranes	1
GMS 6073	Disorders of the Developing Nervous System	1
GMS 6074		3
GMS 6078	Synaptic Function and Plasticity	1
GMS 6079	Computers in Biology	1
GMS 6080	Basic Magnetic Resonance Imaging	1
GMS 6592	Ion Channels Journal Club: Pharmacology, Biophysics, and Neuroscience of Excitable Membranes	1
GMS 6705	Functional Human Neuroanatomy	5
GMS 6709	Current Topics in Vision	1
GMS 6711	Neurobiology of Pain	1
GMS 6750	Molecular Pathobiology of Neural Disease	1
GMS 6791	Visual Neuroscience Journal Club	1-2
GMS 6792	Neuroscience Graduate Research Seminar	1
GMS 7794	Neuroscience Seminar	1
GMS 7795	Special Topics in Neuroscience	1-4

Advanced Concentration in Oral Biology Courses

Code	Title	Credits
GMS 6160	Introduction to Oral Biology I	2
GMS 6161	Introduction to Oral Biology II	2
DEN 6680	Principles and Craniofacial Biology and Emerging Therapies	2
DEN 6681	Craniofacial Pathobiology	2

Advanced Concentration in Medical Physiology and Pharmacology Courses

Code	Title	Credits
GMS 6051	Signal Transduction	1
GMS 6052	Ion Channels of Excitable Membranes	1
GMS 6053	Cancer Biology and Therapeutics	1
GMS 6400C	Principles of Physiology	6
GMS 6401	Medical Renal Physiology	2
GMS 6402	Medical Respiration Physiology	3
GMS 6405	Fundamentals of Endocrine Physiology	1
GMS 6406	Fundamentals of Pulmonary/Respiratory Physiology	1
GMS 6408	Fundamentals of Renal Physiology	1
GMS 6410	Physiology of the Circulation of Blood	2
GMS 6411	Fundamentals of Cardiovascular Physiology	1
GMS 6415	Fundamentals of Gastrointestinal Physiology	1
GMS 6419	Medical Endocrinology and Reproduction	3
GMS 6440	Fundamentals of Medical Physiology	1

GMS 6474	Medical Cardiovascular and Muscle Physiology	3
GMS 6479	Medical Gastrointestinal Physiology	2
GMS 6491	Journal Club in Physiology	1
GMS 6563	Molecular Pharmacology	1-3
GMS 6590	Seminar in Pharmacology	1
GMS 6592	Ion Channels Journal Club: Pharmacology, Biophysics, and Neuroscience of Excitable Membranes	1
GMS 7593	Topics in Pharmacology and Toxicology	1-3

Advanced Concentration in Clinical and Translational Science Courses

College of Medicine Courses

Code	Title	Credits
GMS 5905	Special Topics in Biomedical Sciences	1-4
GMS 6001	Fundamentals of Biomedical Sciences I	5
GMS 6003	Fundamentals of Graduate Research and Professional Development	1
GMS 6004	IDP Practical Laboratory	2
GMS 6008	Fundamentals of Physiology and Functional Genomics	2
GMS 6009	Principles of Drug Action and Therapeutics	3
GMS 6090	Research in Medical Sciences	1-10
GMS 6096	Introduction to NIH Grant Writing for Biomedical Sciences	1
GMS 6160	Introduction to Oral Biology I	2
GMS 6161	Introduction to Oral Biology II	2
GMS 6193	Research Conference in Oral Biology	1-3
GMS 6405	Fundamentals of Endocrine Physiology	1
GMS 6406	Fundamentals of Pulmonary/Respiratory Physiology	1
GMS 6408	Fundamentals of Renal Physiology	1
GMS 6411	Fundamentals of Cardiovascular Physiology	1
GMS 6415	Fundamentals of Gastrointestinal Physiology	1
GMS 6491	Journal Club in Physiology	1
GMS 6780	Addiction: Neuroscience and Trends	3
GMS 6845	Clinical & Translational Research Practicum	3
GMS 6865	Quantitative Literacy for Translational Research	2
GMS 6875	Ethical and Policy Issues in Clinical Research	2
GMS 6895	CTS Journal Club	1
GMS 6903	Manuscript and Abstract Writing for Clinician/Scientists	2
GMS 6905	Independent Studies in Medical Sciences	1-10
GMS 6910	Supervised Research	1-5
GMS 6940	Supervised Teaching	1-5
GMS 6971	Research for Master's Thesis	1-15
GMS 7093	Introduction to Clinical and Translational Research	2
GMS 7877	Responsible Conduct of Biomedical Research	1
GMS 7944	Practicum in Biomedical Science Education	3
GMS 7950	Fundamentals of Biomedical Science Education	2
GMS 7979	Advanced Research	1-12
GMS 7980	Research for Doctoral Dissertation	1-15

Students will identify and explain the core knowledge for the Interdisciplinary Program (genetics, cell biology, biochemistry/molecular biology) followed by concentration-specific core knowledge (genetics, molecular cell biology, immunology/microbiology, physiology/pharmacology, biochemistry/molecular biology, or neuroscience). At the most basic level, this will include recognizing and explaining fundamental facts in the disciplines. At the intermediate level this will include explaining relationships between facts and explanation of mechanisms of biological processes. At the most advanced level this will include interpreting experimental data and designing experiments.

SLO2 Research Skills

Students will read, interpret and critically analyze published literature in their field to formulate hypotheses; design a technically sound and up-to-date experimental plan with appropriate controls; execute the experimental plan in a technically proficient manner; interpret the data; and then reformulate the hypotheses.

SLO3 Professional Behavior

Students apply professional behavior in their conduct of research, specifically identification and illustration of ethical conduct, including employment of appropriate safety, administrative, and regulatory rules

Medical Sciences (MS)

SLO1 Knowledge

Identifies, describes, and explains key concepts, study designs, and research methodologies necessary to conduct research in medical and health care disciplines

SLO2 Research

Explains research ideas, designs, and produces a scientifically sound clinical/translational research project in an ethically sound manner, which includes testable hypotheses and specific aims, presenting scientific relevancy, stating appropriate statistical and ethical considerations, detailing subject enrollment, data collection and analysis, and reporting how the project will lead to improvement of human health

SLO3 Professionalism

Organize activities that promote self-improvement, scientific teamwork, and improvement in human health

Student Learning Outcomes

Medical sciences (PHD)

SLO1 Knowledge