GRADUATE PROGRAMS OF THE SCHOOL OF MEDICINE

Academic Regulations Governing Master's and Doctoral Degrees

Advanced study programs leading to the Doctor of Philosophy and Master of Science degrees are available in the School of Medicine. Their primary purpose is to provide an opportunity for graduate training in preparation for careers in biomedical research including those in academia, industry, biotechnology, and government. In addition, the programs are designed to provide an educational springboard into a wide variety of related careers including those in medicine, intellectual property (patent) law, regulatory affairs, compliance, healthcare management, science advocacy/policy, teaching, scientific writing, clinical and translational sciences, forensics, and environmental affairs, among others.

Graduate students enter a community of team-oriented scholars and are expected to become acquainted with the development of a main area of study and its relationship to other pursuits. Students should develop into independent and self-directed learners and researchers, acquire useful perspectives on the meaning and limitations of exact science, and maintain a balance between practical and abstract intellectual activity. They are expected to draw from and add to the wealth of accumulated knowledge in their chosen discipline. Graduate students work closely with faculty advisors who help plan course schedules and research programs, supervise laboratory training, and help navigate career options.

For complete information regarding the academic rules and regulations of the University, students should consult Academic Regulations (http://bulletins.wayne.edu/graduate/general-information/academic-regulations/) of this bulletin. The following additions and amendments pertain to the School of Medicine.

Admission

Admission to these graduate programs is contingent upon admission to the Graduate School (http://bulletins.wayne.edu/graduate/general-information/admission/). Requests for program-specific information and requirements should be made directly to the program of interest. Mailing address and individuals to contact are cited below.

Application

Applicants must complete/submit:

1. University Graduate School application;
2. Official transcripts of all undergraduate (and graduate) academic work;
3. Graduate Record Examination scores, verbal, quantitative and analytical writing components.

Individual programs may have additional application requirements, including higher standards for G.P.A. and English proficiency than the Graduate School. Students for whom English is not their native language will be required to demonstrate competency in verbal and written English prior to enrollment.

Most study programs are planned for students who begin in the fall semester; however, matriculation may be possible at other times during the year in individual cases.

The recommended procedure for application is:

1. Consult departmental websites and/or contact the appropriate Graduate Officer for additional information and forms relevant to that program;
2. Submit ALL application materials by February 1 for admission to begin study in the fall semester;
3. Late applications will be evaluated; however, the graduate programs have limited enrollment, and thus late applicants may encounter programs already filled. Most graduate assistantships and fellowships are awarded in the months of February and March; late applicants may have very limited opportunities for this type of financial assistance. Additional financial aid may be available through the Office of Student Financial Aid.

Master of Science Degrees

Descriptions of individual programs may be found in the departmental sections which follow. Two interdisciplinary programs are offered in addition to the discipline-based courses of study: a master's degree program in basic medical sciences and a master's degree program in medical research. These are described below. General requirements for the Master of Science degree may be found under Master's Degrees (http://bulletins.wayne.edu/graduate/general-information/degree-certificate-requirements/#mastersdegreestext).

Doctor of Philosophy Degrees

Programs leading to the Doctor of Philosophy degree in the basic medical sciences are under the jurisdiction of the Graduate School of the University. Ph.D. students, admitted to one of the listed graduate programs, typically enroll in the School of Medicine's Interdisciplinary Biomedical Sciences (IBS) core curriculum during their first year. The IBS is a broad-based curriculum involving courses in Interdisciplinary Molecular and Cellular Biology and selected courses in the systems curriculum. Department and program-specific course requirements and additional information may be found in the individual descriptions of each Ph.D. program.

The eighteen credit dissertation registration requirement is fulfilled by registering for the courses 9991 and 9992 (Doctoral Dissertation Research and Direction I, II, III, and IV, respectively) offered under various subject area codes, in consecutive academic year semesters.

Interdisciplinary Biomedical Sciences (Ph.D.)

The School of Medicine's Interdisciplinary Biomedical Sciences (IBS) curriculum is open only to doctoral students in the School of Medicine. Completion of the Core Curriculum is recommended during the first year of Ph.D. study, based on individual Program requirements The IBS curriculum includes:

Code	Title	Credits
Foundational Course		
IBS 7015	Interdisciplinary Cell and Molecular Biology	
Additional elective courses chosen from the following:		
IBS 7030	Functional Genomics and Systems Biology	
IBS 7050	Molecular Neuropsychopharmacology	
IBS 7090	Fundamentals of Immunology	
IBS 7100	Biomedical Neuropharmacology	
IBS 7130	Systems Neuroscience: Structure and Function of the Nervous System	
IBS 7140	Foundations of Machine Learning and Artificial Intelligence with Python, Scikit-Learn, and PyTorch	
IBS 7320	Protein Structure and Function	

IBS 7330	Advanced Molecular Biology
IBS 7690	Principles and Techniques of Reproductive Biology

Admission of other students requires the consent of the curriculum director.

Joint M.D. and Ph.D. Program

A joint M.D. and Ph.D. program of study may be designed to provide an opportunity for exceptionally talented students to acquire knowledge and expertise in both research and clinical medicine. By combining and interrelating the Doctor of Medicine and Doctor of Philosophy programs, the dual degree objectives may be accomplished effectively and often in a shorter time than is possible by two separate degree programs completed in sequence. Such a program will prepare the student to assume investigative leadership in medical schools and in institutes for medical research. This program is flexible so that it can be adapted to best suit the student's discipline, needs and objectives.

Admission: Students will apply to the joint degree program at the time that they apply to the School of Medicine via the American Medical College Application Service (AMCAS). However, failure to be admitted to the joint degree program will not alter the student's opportunity to be considered for medical admission. In some instances, medical students may be admitted during their first or second year of undergraduate medical school, but this will involve other means of financial support than when he/she has been admitted by a joint process to the M.D-Ph.D. program in the School of Medicine. At the time of acceptance to the joint degree program, students will be required to submit a graduate application. Students interested in a joint degree program may contact the Graduate Programs Office in the School for further information and counseling.

Degree Requirements

The requirements for the joint M.D./Ph.D. degrees conform to those established for the separate degrees by the School of Medicine, the Graduate School (http://bulletins.wayne.edu/graduate/general-information/degree-certificate-requirements/), and the individual departments involved.

- Anatomy and Cell Biology (http://bulletins.wayne.edu/graduate/school-medicine/programs/anatomy-cell-biology/)
- Basic Medical Sciences (M.S.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/basic-medical-sciences-ms/)
- Biochemistry, Microbiology and Immunology (http://bulletins.wayne.edu/graduate/school-medicine/programs/biochemistry-microbiology-immunology/)
- Clinical and Translational Science (Bridge Graduate Certificate) (http://bulletins.wayne.edu/graduate/school-medicine/programs/clinical-translational-science-bridge-graduate-certificate-mdphd-students/)
- Genetic Counseling (M.S.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/genetic-counseling-ms/)
- Medical Research (M.S.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/medical-research-ms/)
- Molecular Genetics and Genomics (http://bulletins.wayne.edu/graduate/school-medicine/programs/molecular-genetics-genomics/)
- Oncology (http://bulletins.wayne.edu/graduate/school-medicine/programs/oncology/)
- Pathology (http://bulletins.wayne.edu/graduate/school-medicine/programs/pathology/)
- Pharmacology (http://bulletins.wayne.edu/graduate/school-medicine/programs/pharmacology/)
- Physiology (http://bulletins.wayne.edu/graduate/school-medicine/programs/physiology/)
- Public Health Programs (http://bulletins.wayne.edu/graduate/school-medicine/programs/public-health/)
- Translational Neuroscience (Ph.D.) (http://bulletins.wayne.edu/graduate/school-medicine/programs/translational-neuroscience-phd/)

Interdisciplinary Biomedical Sciences Courses

IBS 7015 Interdisciplinary Cell and Molecular Biology Cr. 6
The fundamental biochemistry, molecular biology, and function of eukaryotic cells. Includes study of the structure and purpose of the basic components of eukaryotic cells; how eukaryotic cells obtain and utilize energy, process information, and replicate or self-destruct; and examples of how specific cell types contribute to multicellular biological processes and systems in normal and disease states. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students; enrollment limited to students in a Doctor of Philosophy degree; enrollment limited to students in the School of Medicine.

IBS 7030 Functional Genomics and Systems Biology Cr. 2
Exploration of several new technologies for determining gene function on a genome-wide scale and for integrating information into a systems-level view of biological processes. Offered Winter.
Prerequisite: IBS 7015 with a minimum grade of C or MGG 7010 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students; enrollment limited to students in a Doctor of Philosophy degree; enrollment limited to students in the School of Medicine.
Equivalent: MGG 7030

IBS 7050 Molecular Neuropsychopharmacology Cr. 2
Sensory, motor, and integration of nervous systems, including anatomic and cellular organization, systemic and cellular-molecular functions, and diseases. Offered Winter.
Prerequisites: IBS 7015 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students; enrollment limited to students in a Doctor of Philosophy degree; enrollment limited to students in the School of Medicine.

IBS 7090 Fundamentals of Immunology Cr. 2
Cellular-molecular and systemic functions, and diseases of the immune system. Offered Winter.
Prerequisites: IBS 7015 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate level students; enrollment limited to students in a Doctor of Philosophy degree; enrollment limited to students in the School of Medicine.
Equivalent: IM 7010

IBS 7100 Biomedical Neuropharmacology Cr. 2
General principles, including cellular and molecular basis of drug action with special emphasis on neuronal systems. Offered Winter.
Prerequisites: IBS 7015 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate or Medical level students; enrollment limited to students in the School of Medicine.

IBS 7130 Systems Neuroscience: Structure and Function of the Nervous System Cr. 2
Basic principles of neural science through examination of structure and function of the major physiological systems within the brain and spinal cord. Offered Winter.
Prerequisites: IBS 7015 with a minimum grade of C
Restriction(s): Enrollment is limited to Graduate or Medical level students; enrollment limited to students in the School of Medicine.

IBS 7140 Foundations of Machine Learning and Artificial Intelligence with Python, Scikit-Learn, and PyTorch Cr. 3
Introduction to basic concepts of linear algebra and their application to data analysis. MATLAB and PYTHON programs are introduced and employed as tools for practical implementation of computational methods. Offered Fall, Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: BMB 7140

IBS 7320 Protein Structure and Function Cr. 3
Structure, function, and design of proteins: architecture, function, regulation, assembly and evolution of proteins and protein complexes; theory and techniques of kinetic analysis; newer techniques of protein design and engineering. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: BMB 7320

IBS 7330 Advanced Molecular Biology Cr. 2
Modern topics in biochemistry, including nucleic acid dynamics, genomic structure, DNA replication and repair, transcription, RNA processing, translation and protein synthesis. Offered Winter.
Restriction(s): Enrollment is limited to Graduate level students.

IBS 7690 Principles and Techniques of Reproductive Biology Cr. 3
Principles and techniques in reproduction including endocrinology, gametogenesis, fertilization, implantation, embryogenesis, stem cell determination, pregnancy and parturition. Offered Fall.
Restriction(s): Enrollment is limited to Graduate level students.
Equivalent: PSL 7690