

MOLECULAR MEDICINE

IMPORTANT Note About the Doctor of Philosophy in Molecular Medicine Degree

This program is no longer accepting students at this time as this field of study is now the Cell Biology, Genetics and Molecular Medicine discipline within the new Integrated Biomedical Sciences (IBMS) Program. All information in this section of the Catalog is for the current Molecular Medicine students only.

The program in Molecular Medicine offers a research oriented, interdisciplinary course of study leading to the M.S. and Ph.D. degrees. The faculty is composed of both basic and clinical scientists drawn from the Departments of Biochemistry, Cellular and Structural Biology, Medicine, Molecular Medicine, Surgery, Pathology, and Physiology. The objective of the program is to train future scholars in the use of molecular biological approaches for the investigation of fundamental biomedical questions associated with the diagnosis and treatment of human diseases. Through completion of the program, students will have the opportunity to prepare for careers as independent investigators and teachers in cellular and molecular medicine.

The research interests of the faculty cover many areas of molecular and cell biology, including the molecular genetic basis of cancer and tumorigenesis, mechanisms of cancer metastasis, animal models of disease, transcriptional regulation, developmental, bone cell biology in health and disease, mouse genetics, molecular biological basis of aging, DNA repair, genetic recombination, eukaryotic cell-cycle regulation, protein structure, protein degradation, and signal transduction.

The laboratories of the molecular medicine program faculty members are located in The University of Texas Institute of Biotechnology and the Institute for Drug and Development in the Health Science Center. State-of-the-art facilities for cellular and molecular biological research and biochemistry are also available, as well as specialized instrumentation required for electron, fluorescence, confocal, and atomic force microscopy, the generation of transgenic and chimeric mice; biomolecular interaction studies; biopolymer synthesis; peptide and nucleic acid sequencing; and protein purification.

Courses

MMED 5001. Molecular Medicine. 3 Credit Hours.

This course is designed to integrate the fundamental principles of molecular biology with modern medicine. The topics will include the basics of gene mapping, tactics used in the cloning of genes involved in diseases, the analysis of the structure and function of genes in relation to the characteristics of various diseases, alterations of the genome in disease states, and potential strategies to exploit this knowledge in gene therapy. This course will build upon the basic knowledge presented in Advanced Molecular Biology using specific examples of current and future applications of this new knowledge.

MMED 5015. Modern Methods in Cell and Molecular Biology. 1 Credit Hour.

This course is designed to introduce students to the basic experimental techniques used in the study of cell biology, molecular biology, and protein analysis.

MMED 5016. Fundamentals Of Biostatistics. 1 Credit Hour.

Fundamentals of modern biostatistics with special emphasis on proper design of experiments, critical analysis of data and their presentation will be offered. Particularly, modern biostatistical techniques required to solve the practical problems in bioinformatics will be discussed. A refresher of very basic concepts in statistics will be given; however, the course will be devoted to contemporary statistical analysis of data including hypothesis construction and testing, model validation, and data association. The course will include short lectures describing particular statistical problems faced by researchers in molecular biology, approaches to solve them and interpretation of the results of statistical analysis. Extensive practical training using popular statistical software packages will follow each lecture.

MMED 5017. Practical Bioinformatics for Molecular Biologists. 3 Credit Hours.

An introduction to bioinformatics through computer laboratory exercises designed to have students familiar with quantitative multi-dimensional data analysis methods. Problem areas such as sequence analysis, molecular evolution, gene regulation, and pathway construction and analysis will be approached from a practical viewpoint. Comparative genomics and functional genomics will also be covered. The required biostatistics background required for implementation will also be reviewed as part of this course. A combination of survey lectures on broader topics and focused computer exercises covering specific methodologies will be used.

MMED 5019. Graduate Colloquium In Molecular Medicine. 1 Credit Hour.

(1) To train students to critically read and comprehend the scientific literature; (2) To train students to concisely present the data in scientific papers in a manner that conveys the significance of the findings; (3) To sharpen student skills in seminar preparation and presentation with an emphasis on critical evaluation of data, methods, interpretations, and conclusions; (4) To train students to critically evaluate the presentations of their colleagues. This course is not a didactic course. Instead, it is an interactive discussion and presentation formatted course. Participation is the underlying theme of this course and all students will be graded on their overall participation as well as the quality of their presentations. Grading will reflect the improvement shown by each student in each subsequent presentation. Students should address weaknesses indicated to them by the presiding faculty, TA's & Students.

MMED 5020. Research Practicum. 5 Credit Hours.

Independent research experiences under the direction of a faculty advisor for students who choose the Course-Based Plan of Study. Research experiences include training in metabolomics, flow cytometry/FACS analysis, single cell analysis, molecular and cell biology approaches, systems approaches, computational biology, or drug design depending on the interests of the student. Research experiences also include directed research projects in research laboratories involving experimental design, data collection, data analysis, statistical analyses, and data presentation. During the Research Practicum, students will learn about the underlying principles of a particular method. Students will also participate in conducting mini-projects to gain first-hand experiences within a given topic. A written Practicum Report will be generated by the student at the end of each semester of Research Practicum culminating in an oral presentation by the student highlighting the key findings.

MMED 6016. Advanced Molecular Cell Bio. 5 Credit Hours.

This course is a study of the organization and function of the genome at the molecule level. The topics include: gene structure, transcriptional control, RNA structure and processing, translation, genome replication and repair, the molecular biology of tumors, and the molecular genetics of development. This is a general course intended to introduce the student to the important molecules involved in the life processes of the cell. Their structure, function, localization, and interactions will be the focus of study. The students will also be introduced to the implications that these molecular events have in human health and disease.

MMED 6017. Cell Responses To DNA Damage. 1 Credit Hour.

This advanced course will cover recent advancements in the molecular and cellular aspects of cellular responses to DNA damage. Topics include new insights into DNA repair mechanisms, interactions between DNA repair and tumor suppressor genes, and DNA damage- activated cell cycle checkpoints.

MMED 6071. Supervised Teaching. 1-9 Credit Hours.

This course consists of teaching under the close supervision of instructors in Advanced Molecular Biology and Modern Methods in Cellular and Molecular Biology as laboratory assistants, review session, and tutorial leaders. Assistants may be called upon to present formal lectures.

MMED 6091. Seminars On Molecular Medicine. 1 Credit Hour.

Registration every term in residence is required of all Molecular Medicine students.

MMED 6097. Research. 1-12 Credit Hours.

This course consists of independent, original research under the direction of faculty advisor.

MMED 6098. Thesis. 1-12 Credit Hours.

This course consists of research under the supervision of a mentor to complete the requirements for an M.S. degree. Registration for at least one term is required of M.S. candidates.

MMED 7099. Dissertation. 1-12 Credit Hours.

This course consists of research under the supervision of a mentor to complete the requirements for a Ph.D. degree. Registration for at least two terms is required of Ph.D. candidates.