MOLECULAR MEDICINE (MMED)

Courses

MMED 5001. Advances in Personalized Medicine. 2 Credit Hours.
This course is designed to integrate the fundamental principles of cell and molecular biology with modern practices in personalized medicine. The topics will include understanding the molecular mechanisms of human disease, strategies for patient therapy and drug design, and translational strategies for personalized patient care. The course will combine presentations from nationally and internationally renowned speakers in Personalized Molecular Medicine as well as team-based learning approaches to design the next steps in research to advance studies in specific areas of personalized medicine.

MMED 5015. Modern Methods in Molecular Analysis. 2 Credit Hours.
Modern Methods in Molecular Analysis, (MMED 5015), Fall Semester Only - This course is designed to introduce students to the basic experimental techniques used in the study of cell biology, biochemistry, molecular biology, protein analysis, genomics, and personalized molecular medicine. This course will include didactic lectures as well as laboratory demonstrations and group learning activities.

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. 1.5 Credit Hour.
A course designed to provide graduate students with experience in critical reading of the primary literature, seminar preparation and presentation, data analysis and interpretation, and team-based learning as they relate to Personalized Molecular Medicine.

MMED 5020. Research Practicum. 2.5-5.5 Credit Hours.
Independent research experiences under the direction of a faculty advisor for students who choose the Course-Based Plan of Study for the Master of Science in Personalized Molecular Medicine Program. 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 and how to apply this method to address a specific scientific aim. Students may 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, Cellular, and Synthetic Biology. 4 Credit Hours.
Advanced Molecular, Cellular, and Synthetic Biology, (MMED 6016), Fall Semester Only- This foundational course is a study of the organization and function of the genome at the molecular level. The topics include: gene structure, transcriptional control, RNA structure and processing, translation, genome replication and repair, the regulation of cell division, signal transduction, hormone regulation, epigenetic regulation, the molecular biology of tumors, and the regulation of proteins. Also included will be the use of CRISPR-Cas and other synthetic biological methods used in research and clinical applications (Science 2015 349; 1564). This is an advanced 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 and how research of these molecular events can form the foundation of personalized molecular medicine approaches.

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 in Molecular Medicine. 1.5 Credit Hour.
This course includes presentations from nationally and internationally renowned speakers in Molecular Medicine. This course will share with students the most up-to-date research discoveries in Molecular Medicine. Additionally, this course will include a unique annual mini-symposium in which leaders from biotechnology and pharmaceutical companies will speak to students about jobs, patents, entrepreneurial endeavors, clinical trials, drug discovery, and integrating academics with business.

MMED 6097. Research. 1-12 Credit Hours.
Independent research under the direction of a faculty mentor for students who choose the Thesis-Based Plan of Study for the Master of Science in Personalized Molecular Medicine Program and also for the Ph.D. students in the Molecular Medicine Graduate Program. Independent research experiences will be determined by the faculty mentors along with the student. Students will conduct research projects to gain first-hand experiences within a given topic. (Variable SCH 1-12).

MMED 6098. Thesis. 1 Credit Hour.
Independent research under the direction of a faculty mentor for students who choose the Thesis-Based Plan of Study for the Master of Science in Personalized Molecular Medicine Program. Independent research experiences will be determined by the faculty mentors along with the student. Students will conduct research projects to gain first-hand experiences within a given topic, write a Master¿s Thesis, culminating in an oral Thesis Defense by the student highlighting the key research findings.

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.