MDPM - Molecular Diagnostics and Precision Medicine

MDPM 500 Principles of Molecular Diagnostics (3 Credit Hours)
Course will cover basic concepts of molecular biology including nucleic acids, chromosomes, DNA replication, transcription, and translation and the role of inherited and acquired mutations in disease. The role of clinical molecular diagnostics in detection, prognosis, theranostics, and monitoring and management of patients with inherited and infectious diseases will be explored.

MDPM 501 Molecular Diagnostics Lab (3 Credit Hours)
Course will cover basic molecular biology laboratory techniques including nucleic acid isolation, restriction enzyme digestion, polymerase chain reaction (PCR), quantitative reverse-transcription PCR, DNA sequencing, western blot, ELISA, and PCR-RFLP. This includes both hands on experience and lecture-based explanation of the science behind the techniques.

MDPM 600 Advanced Clinical Molecular Diagnostics (3 Credit Hours)
This course will cover the molecular pathology of various diseases including epigenetic disorders, metabolic disorders coagopathies, cardiac disease, and infectious disease. It will also focus on cutting edge areas of molecular medicine and diagnostics such as pharmacogenomics, regenerative medicine and the microbiome.

MDPM 601 Advanced Molecular Diagnostics Lab (3 Credit Hours)
Course will cover advanced techniques and technologies in molecular diagnostics. Students will gain hands on experience in diagnostic methods using relative quantification of qRT-PCR, sequencing, and fragment analysis using capillary electrophoresis. Alternative techniques and emerging technologies such as next-generation sequencing will also be discussed.

MDPM 620 Human Subjects Regulations and Ethics (3 Credit Hours)
Students will be engaged and guided through a series of lectures and class discussions that emphasize regulatory and ethical considerations in the clinical molecular diagnostic laboratory, scientific research laboratory, and human subjects research environments. This class will cover issues specific for the Clinical Laboratory (CLIA regulatory environment) as well as Responsible Conduct of Research generally including: conflict of interest; policies regarding human subjects, live vertebrate animal subjects in research, and safe laboratory practices; mentor/mentee responsibilities and relationships; safe research environments (e.g., those that promote inclusion and are free of discriminatory harassment); collaborative research; peer review; data acquisition and analysis; laboratory tools (e.g., tools for analyzing data and creating or working with digital images); recordkeeping practices, including methods such as electronic laboratory notebooks; secure and ethical data use; data confidentiality, management, sharing, and ownership; research misconduct and policies for handling misconduct; responsible authorship and publication; and the scientist as a responsible member of society, contemporary ethical issues in biomedical research, and the environmental and societal impacts of scientific research.

MDPM 640 Molecular Cytology & Histology (3 Credit Hours)
This course will provide didactic training and hands on experience in methodologies associated with clinical and experimental molecular cytology and histology. This includes, immunohistochemistry, immunofluorescence, fluorescent in situ hybridization, and fluorescent chromosome analysis. Students will learn to design and implement experiments using these technologies to answer questions in molecular diagnostics.

MDPM 669 Molecular Diagnostics Pract (3 Credit Hours)
Students will perform directed laboratory research in an academic, industry, or clinical laboratory. Research project will be supervised by student's mentor. Projects must encompass the use of molecular diagnostics techniques and must be approved by an advisory committee selected by the student and approved by the program director. Upon completion of the 15 credit hours, students will present their findings in an open seminar.

MDPM 698 Molecular Diagnostics Lab (3 Credit Hours)
Students will obtain molecular diagnostic research experience in laboratories of prospective mentors. Student will be trained in research methods and procedures and will obtain a perspective on potential projects. Rotations can be completed in academic research, industry, or clinical laboratories. Work must include the use of molecular diagnostic techniques and rotations must be approved by the program director.

MDPM 720 Genomics and Bioinformatics (3 Credit Hours)
Genomics and Bioinformatics combines a didactic survey of topics important for understanding the origin, curation, advantages, and limitations of a variety of key genomic resources with hands-on training in the proper use of widely accessed web-based genome resources and common web-based bioinformatic tools.