2024-25

PRECISION MEDICINE

Degree Offered: Master of Science

Program Description

The Precision Medicine Education program based in the Medical College of Wisconsin Institute for Health & Equity in partnership with the Mellowes Center for Precision Medicine and Genomic Medicine offers online coursework toward a 30- credit Master of Science in Precision Medicine (PM) degree. Clinicians and other participants in the program will advance their knowledge, skills, practices, and competencies in PM. Learners may also enroll in courses as non-degree- seeking students.

Admission Requirements

In addition to the general Graduate School admission requirements, this program has additional specific requirements.

All applicants will be required to submit their clinical or medical license as part of the application process.

Credits Required to Graduate

30 credits

Required Courses

42100 Introduction to Precision Medicine. *3 credits.*
Introduction to Precision Medicine offers 10 applied learning sessions led by directors of PM Education courses. Students initiate a professional development plan and write and present reports explaining PM concepts, demonstrating research in practice, and judging the validity of PM information.

42283 Precision Medicine Research Plan. *3 credits.*
Prerequisite: 42100 Introduction to Precision Medicine
This course requires students to develop a PM research question, to perform a literature review and analysis of the topic, and to create a research plan for IRB submission, if needed. The work is guided by a primary mentor and reviewed by two faculty advisors.

42299 Precision Medicine Master's Thesis. *3 credits.*
Prerequisite: 42100 Introduction to Precision Medicine
This course requires students to implement a research plan and to write a manuscript discussing the results. The work is guided by a primary mentor and reviewed by two faculty advisors.

Required Courses as Needed

42002 Master's Thesis Continuation. *0 credits.*
This is a form of registration available to students who have completed all of the required coursework, including thesis credits but have not yet completed the writing of the Thesis.

Continuation status is limited to three consecutive terms following the completion of Thesis credits.

Elective Courses

Students must pick seven PM elective courses.

42155 Epigenomics for Precision Medicine. *3 credits.*
Prerequisite: 42100 Introduction to Precision Medicine
This course is designed to introduce students to Epigenetics and Epigenomics, an important foundation of modern medicine, in particular as an advanced discipline of Precision Medicine. Epigenomics refers to the inheritance of traits independent of the coding capacity of the DNA and is highly influenced by the environment. Fortunately, epigenomic dysregulations that cause diseases are often amenable to therapeutic intervention, thereby auguring the birth of novel therapeutics. Additionally, like genomics, epigenomics is providing promising biomarkers for diagnosis, prognosis, and real-time surveillance of disease progression. In this course, students will discuss molecular mechanisms underlying epigenetic events, the tools for the design and execution of research in this discipline, how to generate and analyze epigenomic data, and the application of Epigenomics to diagnostics, prognostics, and treatments. Entry level visualization of bioinformatics will be covered as it relates to Epigenomics. No prior bioinformatic knowledge is necessary to enroll for course.

42170 Medical Genetics, Undiagnosed, and Rare Diseases. *3 credits.*
Prerequisite: 42100 Introduction to Precision Medicine
Medical Genetics, Undiagnosed and Rare Diseases allows students examine the application of genomics to core clinical systems and applying that knowledge to personalized management of patients. Experts in their respective fields will guest lecture in several sessions.

42175 Pharmacogenomics for Precision Medicine. *3 credits*.
Prerequisite: 42100 Introduction to Precision Medicine
This elective course is essential and important to Precision Medicine Education of interested enrolled clinician learners. The topic is a session in the Introduction to PM course and harmonizes with the other courses. The topic is also included in a therapeutics chapter in the 8th edition of the classic textbook Thompson & Thompson Genetics in Medicine.

Elective offered by the MCW IDP Program:
16270 Integrated Microbiology and Immunology. *3 credits.*
The purpose of this course is to introduce basic and integrated concepts in immunology and cellular microbiology through lectures, readings from texts and current journals. The course is geared toward first year students matriculating into the Microbiology and Immunology (MI) Graduate Program as well as any student interested in contemporary concepts of cellular microbiology, immunology, and host-pathogen interactions. The course has been designed to integrate fundamental concepts in immunology and microbiology with the goal of students being able to understand and critically evaluate the complex nature of host-pathogen interactions and immune dysfunction regardless of their specific research focus. Students learn fundamental concepts in immunology and gain an appreciation of the basic properties of bacteria and virus structure, replication, and pathogenesis. In the final block of the course, students integrate their knowledge of pathogens and the immune system.

Elective offered by the MCW MSGC Program:

CTSI 20241 Translational Genomics. *3 credits.*

The primary goal of this course is to teach students how to develop a research program to ask relevant genetic questions in the clinical setting utilizing the molecular genetics toolbox. To this end, students will be provided with background in molecular genetics strategies and study designs as well as an understanding of common genetics questions emanating from the clinic so that they will be better able to make connections between bench and bedside. In addition, they will be challenged to think creatively and through a translational focus during course-long case studies and group projects.

GECO 40110 Bioethics in Precision Medicine. *3 credits.*

Prerequisite: 42100 Introduction to Precision Medicine

This course will explore the historical, philosophical, rhetorical, and ethical foundations of precision medicine and analyze the bioethical issues raised by this new medical paradigm as they manifest in a variety of clinical, biomedical, and health policy contexts.

Electives offered by the MCW MPH Program:

PUBH 18223 Public Health Policy. 3 credits

Prerequisite: 42100 Introduction to Precision Medicine

This introductory course will prepare students to know and understand the fundamentals of public health policymaking from the perspective of diverse stakeholders. Throughout the course, students will engage in critical and creative thinking to judge the validity of information and to use defensible and persuasive information to reach new insights in the field of public health policy. Students will be challenged to analyze complex public health policies in areas such as health care reform, health equity, access to care, chronic disease and injury, and global health. This course will assist students in developing the skills necessary to understand and apply diverse sources of information in policy development and the advocacy to implement public health policy.

PUBH 18232 Introduction to Population Health Management. *3 credits*

Prerequisite: 42100 Introduction to Precision Medicine

This course provides knowledge and builds competencies to improve population health outcomes as well as patient and professional experiences and to reduce per person costs. Themes include population health in the US, the population health ecosystem, and creating cultural change. Competencies include leadership and inter-professional communication, systems thinking, social and behavioral sciences, data management, process and outcome improvement, and policy advocacy.

Electives offered through MCW/Marquette University:

BIIN 6931 Topics in Bioinformatics. *3 credits*

Prerequisite: 42100 Introduction to Precision Medicine

Topics vary. Students may enroll more than once as the subject matter changes.

BIIN 17150 Bioinformatics of Systems Biology. *3 credits*
Prerequisite: 42100 Introduction to Precision Medicine
This course will provide skills and concepts for more integrated and holistic thinking about genomics, Bioinformatics oriented toward solving real biological questions.

Electives offered through UW-Milwaukee:
HCA-700 Introduction to Health Care Informatics. *3 credits*
Prerequisite: 42100 Introduction to Precision Medicine
An introduction to the history, theory, applications, and organizational context of health informatics.

Search Classes (uwm.edu)