GENOMICS AND PRECISION MEDICINE

Programs

- Genomics and Precision Medicine, Master of Science (https://catalog.hbku.edu.qa/academic-degrees/chls/gtb/gpm-ms/)
- Genomics and Precision Medicine, PhD (https://catalog.hbku.edu.qa/academic-degrees/chls/gtb/gpm-phd/)

Division Courses

Core Life Sciences

CLS 600 Techniques in Biochemistry **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course is designed to train students in a range of standard biochemical and cellular biology techniques that are in routine use in a functioning biochemistry laboratory. The course combines lectures illustrating the scientific principles underlying a particular technique with hands-on experience of the methodology in the laboratory. Techniques include protein expression, purification, gel analysis, protein structure and cell culture.

CLS 625 Applied Biostatistics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

The aim of this course is to introduce the fundamental biostatistical concepts to life science students. It aims to give an overview of the statistical and computational ideas required for analysis methods in biological sciences, and provide hands-on experience in analysis. This course does not assume that the student has a background in mathematics and computer science, but introduces all necessary background during the course. The course is appropriate for graduate students and researchers in health and life sciences.

CLS 661 Special Topics in Biosensors **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

Over the past 20 years, the field of bio-sensing technology has had a profound impact on both laboratory research as well as commercial activities. With the advance of semiconductor and nanofabrication technologies, bio-technological application-specific integrated circuits (ASICs) have become a major trend in research as well as industry. Examples include DNA sensing, microelectrode measurement array systems for in-vitro and in-vivo physiological research at the cellular level. Bio-sensing has had a major impact on different fields including, E-health systems, genome research and drug development.

CLS 706 Independent Studies **3 Credits**
Grade Mode: Standard Letter

Independent Studies allow students to examine a variety of timely, cutting-edge research areas in life sciences. Taught by our faculty, research scientists from our research institutes or associated industries, this course allows students to keep up with novel trends and topics in the field.

CLS 711 Development and Diseases of The Nervous System 3 Credits
Grade Mode: Standard Letter, Audit/Non Audit

The aim of the course is to unfold the processes that underlie the formation and disorders the nervous system at the molecular, cellular and circuitry levels. The course will focus on genes/proteins and signaling pathways involved in neural induction, neural tube closure, patterning of the nervous system, neurogenesis, neuronal migration, axon pathfinding, as well as formation and refinement of synapses. Both physiological and pathological conditions will be addressed.

CLS 726 Proteomics in Precision Medicine **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

Personalized medicine has revolutionized the medical practice, and to achieve its goals today we are not only dependent on genomics but also on the proteomics for accurate diagnosis and efficient treatments. Thus, there is a growing demand for proteomics-based learning and applications in the field of basic and clinical research. The course 'Proteomics in precision medicine' will bridge this knowledge gap in the GPM program by teaching the students key concepts of proteomics and the overall applications and limitations.

CLS 751 Molecular Mechanisms of Cancer and Their Applications **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course will introduce students to the molecular mechanisms that lead to cancer development. It will describe the methods used to study these mechanisms and how they can be exploited in cancer diagnostics and therapy.

Genomics & Precision Medicine

GPM 601 Research Methods and Ethics in Health and Genomics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course aims to provide a comprehensive overview on research ethics, scientific thinking, and academic writing as well as guidelines for study design and good research practice. The course will also offer state-of-the-art knowledge relating to novel methods in genomics, precision medicine, and health analytics.

GPM 602 Clinical Applications in Genomics and Precision Medicine **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course covers fundamental concepts in the application of genomic and precision medicine in a clinical context. Included are modules on relevant technologies with emphasis on data interpretation for clinical outcome, drug design, as well as problem based learning components in clinical genomics and precision medicine

GPM 604 Advanced Genetics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

The course covers important concepts and principles in genetics, such as inheritance, developmental processes, genetic variability, genetic mapping of diseases as well as genetic testing, DNA sequencing technologies, and treatment approaches to genetically inherited diseases.

GPM 607 Molecular Pathology **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course covers current concepts in molecular pathology and their application in translational research and diagnostics, with particular emphasis on the molecular pathology of cancer, cardiovascular, neurological and infectious disease.

GPM 695 Master's Thesis Hours **0-6 Credits**
Grade Mode: Pass/Non Pass

Full time work in a laboratory to perform experiments related to the MS Thesis dissertation. Thesis research is an essential component of the graduate degree in Biological and Biomedical Sciences at HBKU. All students are required to engage in thesis research.

GPM 705 Introduction to Data Science **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

Genomics and precision medicine require handling, exploring and understanding large data sets. This course aims to introduce students to basic concepts from probability, statistical inference, linear regression and machine learning using R. No previous knowledge of programming is required, as the course will introduce basic programming concepts and through examples will enable students to ask the right questions, perform their own analyses and visualize the results effectively. The course will provide the students with hands-on programming experience.

GPM 720 Pharmacogenomics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

This course covers fundamental concepts in the field of Pharmcogenomics and how it will help in the realization of personalized medicine. It will include the basic principles of drug discovery and design, pharmacology, pharmacogenetics and pharmacogenomics applied to several disease conditions.

GPM 721 Bioinformatics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

The course will convey the fundamentals of bioinformatics methods for genomics data analysis to life science students. It aims to communicate the computational ideas behind key analysis methods in genomics and to provide practical training in using web-based tools and bioinformatics software packages in R. It will enable students to perform basic analysis steps for sequencing data. This course does not assume that the student has a background in mathematics and computer science, but rather introduces mathematical concepts and/or programming languages, as they are needed.

GPM 733 Epigenetics **3 Credits**
Grade Mode: Standard Letter, Audit/Non Audit

GPM 733 is an elective epigenetic course. The course will provide an introduction to various epigenetic mechanisms and explain how they determine chromatin architecture and control gene expression. This is important to understand transcriptional regulation particularly during development, as well as during stem cell (re)programming. In addition, the course will cover how epigenetic alterations can cause aberrant silencing or activation of genes that can have an influence on health and disease. An acquaintance with the field of epigenetics is essential for a major in Genomics and Precision Medicine.

GPM 890 Dissertation Hours **0-9 Credits**
Grade Mode: Pass/Non Pass

Full time work in a laboratory to perform experiments related to the PhD Thesis dissertation. Thesis research is an essential component of the graduate degree in Biological and Biomedical Sciences at HBKU. All students are required to engage in thesis research.