

# INTERDISCIPLINARY MEDICINE (IMED)

## IMED 7004 Human Brain Imaging Methods 1.5 cr

The role of in vivo brain imaging (e.g., CT, MRI, PET, SPECT) have been rapidly increasing in the multiple disciplines that investigate the human brain in both clinical and nonclinical domains. The basic concepts, mechanisms and analytical techniques will be introduced for different imaging methods. Students will gain knowledge about what can be done and what cannot be done with each modality.

## IMED 7092 Cell Biology A Introductory 3 cr

Lecture, seminar, tutorial and/or demonstration course devoted to basic structure and molecular functions of the different parts of the cell, beginning with the nucleus and concluding with the cell membrane. Topics include basic genetic inheritance principles, chromosomes and gene regulation, protein synthesis and sorting, mitochondrial functions and genetics, biochemical and electrical properties of cell membrane functions.

## IMED 7094 Cell Biology B Special Topics 3 cr

Lecture, seminar, tutorial and/or demonstration course devoted to the coordination and integration of cellular functions in complex multicellular organisms. Topics include functional interactions between extracellular matrix, cytoskeletons and membranes, cell and extracellular matrix interactions, cell-to-cell communication including signal transduction mechanisms, concepts in the regulation of cell growth and cell death and pluripotent stem cells, and their relevance to normal organ/body development and malignancy.

## IMED 7096 Stem Cell Biology: Introduction to the Principles of Regenerative Medicine 1.5 cr

"Stem Cell Biology" focuses on current knowledge of stem cell biology and regenerative medicine. We will discuss different conceptual aspects of stem cell properties and potency with a solid coverage of fundamental concepts including stem cell niches and microenvironment. We will further highlight the importance of stem cells in relation to human diseases including cancer (cancer stem cells), spinal cord injury, stem cell modeling of neurological disorders, and transplantation. Finally, this course will have an informative session on important ethical issues surrounding embryonic stem cells. This course is suitable for a broad range of graduate students with relevant research interests in stem cell biology and regenerative medicine.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: A basic course in Biology or consent of the instructor(s).

## IMED 7098 Cancer Stem Cell Concepts and Therapeutic Applications 1.5 cr

This course will introduce normal and cancer stem cell concepts, with an emphasis on the hierarchical of tumours and the diverse roles of tissue microenvironment in sculpting tumour cell phenotypes. Also, targeting of putative cancer stem cells will be discussed in the context of developing novel treatment strategies.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: Undergraduate course in cell biology or consent of instructor(s).

## IMED 7100 Fundamentals of Neuroscience 6 cr

An interdepartmental multidisciplinary course providing a comprehensive overview of cellular, molecular, developmental and systems neuroscience, as well as the neurobiology of disease. Emphasis will be placed on the application of the fundamental principles of neuroscience to contemporary lab research. ANAT 7270 will provide instruction in neuroanatomy and structure-function in the nervous system.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: Permission of instructor.

## IMED 7104 Neural Stem Cells: Biology and Regenerative Medicine Applications 1.5 cr

This course will discuss current concepts in Neural Stem Cells from basic neurobiology (development, fate specification and maintenance) to their potential clinical applications in treating a broad range of neurological disorders through cell transplantation as well as gene and drug delivery. Neural stem cells play critical roles in the nervous system and the course is developed to build the necessary knowledge for graduate students and residents within all disciplines in neurosciences.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: By instructor approval only.

## IMED 7106 Stem Cell Therapy and Tissue Engineering 1.5 cr

Stem cell therapy opens up new avenues and has the potential to provide permanent solutions to many irreversible disorders in the body. This course will discuss different aspects of stem cell mediated repair and challenges involved in taking stem cells to the clinical applications. This course will further discuss the use of biomaterials based approaches to enhance homing and engraftment of transplanted stem cells in different organs. The course will also provide an overview of current status of stem based clinical trials, regulatory requirements in clinical practice, and ethical issues that arise.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: by instructor approval only.

## IMED 7112 Fundamental Cellular Neurobiology 1.5 cr

This lecture-based course covers the fundamentals of cellular/molecular neurobiology of the nervous system. It will normally be offered on a two year cycle, and students interested in registering should contact the Course Director.

## IMED 7114 Fundamental Neural Development and Plasticity 1.5 cr

This lecture-based course covers the fundamentals of development and plasticity of the nervous system. It will normally be offered on a two year cycle, and students interested in registering should contact the Course Director.

## IMED 7116 Fundamental Systems Neuroscience 1.5 cr

This lecture-based course covers the fundamentals of systems based neuroscience. It will normally be offered on a two year cycle, and students interested in registering should contact the Course Director.

## IMED 7118 Fundamental Neurobiology of Disease 1.5 cr

This lecture-based course covers the fundamental neurobiology of diseases of the nervous system. It will normally be offered on a two year cycle, and students interested in registering should contact the Course Director.

## IMED 7120 Medical Biochemistry 3 cr

Biochemistry of carbohydrates, lipids, proteins and nucleic acids focused on those areas relevant to structure and function of the human body and disease processes. All students are expected to have completed an introductory biochemistry course. The course will consist of lectures, tutorials, and assigned studies.

**IMED 7130 Foundations in Human Population and Evolutionary Genetics 1.5 cr**

This course will examine how human evolutionary history and sociogenetic processes have shaped contemporary patterns of genetic variation, how we can use these patterns to understand the histories and relationships of contemporary human populations, and appropriate methods to assay and interpret these genetic variation patterns.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: Incoming students must have passed the graduate Medical Genetics (IMED 7170) course or its undergraduate equivalent, Introduction to Human Genetics (BGEN 3020), or equivalent course prior to taking this course.

**IMED 7140 Advanced Topics in Human Population and Evolutionary Genetics 1.5 cr**

This course will examine the latest genetic evidence on the origins and evolution of anatomically modern humans and their peopling of the world, the coevolution of genes and culture, and the emergence and dispersal of genetic risk factors for Mendelian and complex diseases and traits that afflict contemporary human populations.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: Incoming students must have passed the Foundations in Human Population and Evolutionary Genetics (IMED 7130) or an equivalent course prior to taking this course.

**IMED 7170 Medical Genetics 3 cr**

Designed to introduce graduate students to the field of human genetics. Both basic science and clinical issues will be discussed in this course.

**IMED 7180 Molecular Approaches in Medical Research 3 cr**

For students who wish to understand advances made in medicine/biology through molecular and developmental approaches. Topics for discussion will be selected from the recent literature in consultation with participating students. The course will consist of lectures and discussions as well as written and oral presentation of papers by the students.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: consent of instructor.

**IMED 7190 Medical Immunology 3 cr**

This interdisciplinary courses deals with the molecular and cellular mechanisms underlying immunologically mediated human diseases.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: IMMU 7070 plus cognate courses in human biology or by consent of instructors.

**IMED 7200 Cancer Biology 3 cr**

Biology of cancer including genetics, biochemistry, diagnostics and therapeutics with a focus on fundamental, translational and clinical application.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: All students are expected to have completed an introductory biochemistry, cell biology or genetics course and will require consent of instructor.

**IMED 7210 Epigenetics in Development and Human Diseases 1.5 cr**

Emphasis on current understanding about the dynamic mechanisms that instruct when and where genomic DNA is turned on or off. We will discuss the epigenetic mechanisms that control differentiation of specialized cell types during development. Additionally, this course will highlight recent advancements on the impact of epigenetics in neurodevelopmental diseases with regards to the etiology, progression, diagnosis and treatment. In this respect, application of stem cell biology in regenerative medicine, genome-wide genetic-epigenetic strategies and gene therapy approaches will be discussed.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisite: A basic course in biology, or consent of instructor.

**IMED 7212 Introduction to the Mechanisms of Disease 3 cr**

(Formerly: PATH 7020) This course introduces the student to the basic principles of disease processes, with use of case models to illustrate mechanisms. An assigned review, in conjunction with an essay and power point presentation will form part of the course. There are no course prerequisites.

**IMED 7242 Nucleic Acids: Structure and Function in Normal Development and Diseases 1.5 cr**

This course is designed to provide students with a basic knowledge on nucleic acids structure and function. It will highlight how DNA and RNA contribute to the mechanisms and underlying normal development as well as pathologies including cancer and genetic diseases. To be fully beneficial for the student, it is highly recommended that this course be taken together with IMED 7244.

**IMED 7244 Nucleic Acids: Manipulation in Biomedical Research 1.5 cr**

This course is designed to provide students with a basic knowledge on nucleic acids manipulation. It will highlight how DNA and PNA can be modified and used in Biomedical Research. To be fully beneficial for the student, it is highly recommended that this course be taken together with IMED 7242.

**IMED 7280 Medical Computational Biology 3 cr**

"Medical Computational Biology" provides the basic knowledge necessary for students to pursue research in the use of computational methods in biomedical research. The course will focus on concepts necessary for applying computation to genomics, transcriptomics and proteomics experimental data and their application to topics relevant to human health. This course is suitable for a broad range of students with interest in large scale biomedical research.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: a basic course in biology and mathematics or the consent of the instructor(s).

**IMED 7290 Developmental Biology 3 cr**

Emphasizes current principles of organ system development and its application to transgenic approaches to gene function in the context of a whole, developing organism.

**PR/CR: A minimum grade of C is required unless otherwise indicated.**

Prerequisites: IMED 7090 or consent of instructor.

**IMED 7300 Microscopy, Optics, Imaging and Analysis in Health Research 3 cr**

Theory and practice of modern microscopy, optics, molecular imaging, and analyses used in health research. Participants will gain in depth knowledge through seminars by local and external experts in the field and by hands-on laboratory work in preparing samples for imaging and analyses. Images will be acquired using equipment at the Genomic Centre for Cancer Research and Diagnosis at the Manitoba Institute of Cell Biology. Students will also participate in interactive tutorials and journal club.

**IMED 7302 Advanced Molecular Imaging 3 cr**

Seminar course in which students will learn about innovative methods and advanced analyses of molecular imaging in biomedical research including 2-dimensional and 3-dimensional fluorescent in situ hybridization, live-cell imaging, spectral imaging, and multi-colour imaging. Students will participate in hands-on laboratory exercises, interactive tutorials and journal club.

**IMED 7304 Functional Genomics and Whole Genome Analyses 3 cr**

Seminar course in which students will learn about functional genomics and approaches to whole genome analyses using array technologies. Course content will be delivered by local and external experts in the field. Students will participate in hands-on laboratory exercises with micro-array platforms and computer-based data analyses, interactive tutorials and journal club.

**IMED 7410 Biomedical Trainee Skills 3 cr**

A course theoretical and practical instruction in scientific investigation, including research ethics, research design, data evaluation and presentation, as well as critical reviewing and preparation of applications for research funding.