

# BIOMEDICAL AND MOLECULAR SCIENCES

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## **BMED 804 Clinically Oriented Anatomy**

A detailed study of the gross and functional anatomy of the human body with emphasis on clinical application. The course is given jointly with part of Phase I of the medical curriculum. Additional work prescribed for graduate students. Fall and Winter terms; lectures, laboratories and tutorials. L.W. MacKenzie.

EXCLUSION: ANAT 814

## **BMED 805 Microteaching in Anatomical Sciences**

Microteaching as a technique for new and experienced teachers will involve the presentation of a series of 3 minute micro lectures with video recording and feedback sessions. Fall term; L.W. MacKenzie.

EXCLUSION: ANAT 835

## **BMED 806 Advanced Topics in Embryonic Development**

This half credit course will be offered to students who have completed ANAT 417 in their undergraduate studies in the Queen's Life Sciences Program. Through a series of tutorials and seminars, the course will focus on the most up to date discoveries in three areas of developmental biology. The areas reflect the expertise in the department. Winter term; Instructor L.W. MacKenzie

EXCLUSION: ANAT 836

## **BMED 807 Current Topics in Anatomy and Cell Biology**

The topics will be chosen on the basis of special needs of the students, and must be approved by the Coordinator of Graduate Studies. Seminars. Not offered 2023-24.

EXCLUSION: ANAT 926

## **BMED 809 Principles of Drug Discovery and Development**

An advanced course in which various aspects of the drug discovery and development process, from molecules to community, will be studied. The course comprises lectures, discussion and student seminars, based on recent literature. Topics encompass medicinal chemistry approaches to drug discovery, receptor theory, mechanisms of drug action, drug metabolism, pharmacokinetics, pharmacogenetics, drug resistance, clinical trials, and regulatory affairs. 3 hour seminar. Given in years ending with an odd number. Winter term; L. Winn. Not offered 2023-24.

PREREQUISITE: Permission of the Graduate Program required.

EXCLUSION: PHAR 811

## **BMED 810 Protein Structure and Function**

This course presents an integrated approach to the study of protein function. Topics include proteomic techniques in protein profiling, mass spectrometry, 2 D

gel electrophoresis, yeast 2 hybrid analysis, protein chips, protein purification, imaging, surface plasmon resonance, calorimetry, bioinformatics and protein evolution, protein modifications and processing, interpretation and applications of 3 D structure, protein structure function relationships. Offered jointly with BCHM 410 with additional work required. Three lecture hours per week. Winter term; Z. Jia.

PREREQUISITES: BCHM 310 or 315 /316 /317 or permission of the instructor.

EXCLUSIONS: BCHM 410, BCHM 810

## **BMED 811 Advanced Molecular Biology**

This course concentrates on the molecular biology of mammalian models particularly mechanisms involved in human diseases. The human genome project, forensic analysis, DNA diagnostics of human diseases, models of transcriptional and growth regulation and cancer, DNA repair, RNA processing and translation are all discussed. Emphasis on recent findings and course materials will be drawn from current reviews. Three lecture hours per week. (Offered jointly with BCHM 411 with additional work required.) Winter term. C. Mueller

PREREQUISITE: BCHM 310 or 315 /316 /317 or permission of the instructor

EXCLUSIONS: BCHM 411, BCHM 811.

## **BMED 812 Advanced Neuroanatomy**

This course includes the study of the structure and general function of the nervous system and is given jointly with ANAT 312 . Special topics assigned for seminars and essay projects. Fall term; lectures, laboratories and seminars. L. Mackenzie

EXCLUSION: ANAT 812

## **BMED 813 Advances in Neuropharmacology**

Recent advances in understanding neurotransmission and pharmacology in the central nervous system will be discussed. The current literature describing progress in understanding molecular, cellular and behavioural aspects of brain function, and the impact of drugs and disease, will be examined. Seminars. Given in years ending with an odd number. Not offered 2023-24.

PREREQUISITE: Permission of Graduate Program.

EXCLUSIONS: PHAR 810 , NSCI 813

## **BMED 815 Mechanistic Toxicology**

An advanced, problem based course focusing on current approaches to the study of mechanisms of chemical toxicity. 3 hour seminars and tutorials. Given in years ending with an even number. Not offered 2023-24.

PREREQUISITE: PHAR 416 or equivalent. Permission of the Graduate Program required.



EXCLUSION: PHAR 815

### **BMED 816 Biology of Reproduction**

A comprehensive overview of the cellular and molecular biology of mammalian reproduction. The first part of the course consists of lectures covering gametogenesis, fertilization, early embryo development and placentation. The second part involves student presentation of seminars and group discussion of current topics in reproductive biology. Clinical aspects of reproduction will also be covered. Offered jointly with ANAT 416. Graduate students submit one major essay and give a seminar from a list of selected topics. Three hours lecture/seminar, Fall term. F.W.K. Kan. Not offered 2023-24.

PREREQUISITE: ANAT 215 /216 or ANAT 311, or ANAT 309 or permission of the Department.

EXCLUSION: ANAT 816

### **BMED 817 Mammalian Embryonic Development**

Overview of mammalian development, emphasizing the cellular and molecular mechanisms that direct embryogenesis. The first 2/3 of the course consists of lectures on gastrulation, neurulation, establishment of the body axes, differentiation, sex determination, limb development, and organogenesis. The last 1/3 of the course involves student seminar presentations and group discussions of current topics in developmental biology and teratology. Offered jointly with ANAT 471. Students submit a major essay and give a seminar from a selected list of topics. Three hours of lectures/seminars per week. Winter term; Instructor TBD. Not offered 2023-24.

PREREQUISITE: ANAT 416/ANAT 816, or BMED 816, or permission of the Department.

EXCLUSIONS: ANAT 817, ANAT 471

### **BMED 818 Chemical Neuroanatomy**

A contemporary and comprehensive assessment of the neurochemical features of the mammalian nervous system as they relate to development, function and disease. 3 hour lecture/seminar. Offered alternate years. Fall term; M. Kawaja. Not offered 2023-24.

PREREQUISITE: ANAT 312 or LISC 322 or permission of the Department.

EXCLUSION: ANAT 818

### **BMED 822 Cellular and Molecular Neuroscience**

An in depth study of the biophysical properties of neurons and diseases that affect the function of neurons and glia. Topics will include cable properties of dendrites, voltage and ligand dependent channels, and molecular mechanisms responsible for neuronal death and regeneration. The course will be based on lectures and student seminars of selected readings. Given concurrently with LISC 422, with additional

assignments for graduate students. Enrolment is limited. Winter term; E. Dumont. Not offered 2023-24.

PREREQUISITE: LISC 322 with a minimum of B (70%) or an equivalent course or permission of the instructor.

EXCLUSION: ANAT 822

### **BMED 823 Scientific Communication**

The goal of the course is to introduce new graduate students to the basic skills that will be necessary for them to acquire, organize and disseminate information as well as present it effectively. Students will present landmark cell biology papers with a focus on the molecular basis of human disease. (3.0 credit units). Winter term; S. Abraham.

### **BMED 824 Ion Channels of Excitable Cells**

The electrophysiology and biophysics of neuronal and cardiac membranes; molecular biology, structure, and function of ion channels. Students will learn to critically evaluate scientific literature. Instructional format is primarily student led seminars. Enrolment is limited. (Offered jointly with PHGY 424.) Winter term; N. Magoski.

PREREQUISITES: PHGY 214 (or equivalent) with a minimum of 65 percent (or equivalent) or permission of the course supervisor.

EXCLUSION: PHGY 824

### **BMED 825 Medical Neuroscience**

A multidisciplinary graduate level course exposing students to the clinical aspects of neuroscience. Didactic lectures cover detailed organization of the nervous system with clinical implications. Laboratories review basic neuroanatomy and pathology. Clinical demonstrations expose students to several neurological disorders. Didactic lectures, laboratories, and clinical cases (up to 20 hr/week; 9 weeks total.) Winter term; M. Kawaja.

PREREQUISITES: Enrolment in graduate program and involvement in neuroscience research.

EXCLUSION: ANAT 825

### **BMED 827 Advanced Topics in Neuroanatomy**

This half credit course will be offered to students who have completed ANAT 312 in their undergraduate studies in the Queen's Life Sciences Program. Through a series of tutorials and seminars, the course will focus on the most up to date discoveries in three areas of neuroanatomy. The areas reflect the expertise in the department. Fall term; L. MacKenzie.

EXCLUSION: ANAT 837

### **BMED 828 Advanced Histology and Staining Techniques**

An advanced mammalian histology course including advanced staining protocols in demonstrating various components of Histological techniques. Winter and Summer terms; L.W. MacKenzie and S.C. Pang.

EXCLUSION: ANAT 838

### **BMED 831 Cell Structure and Basic Tissues**

For those with no histology background, an outline of basic vertebrate tissues. Extra assignments will be given to graduate students. Fall term. Lectures and laboratories in common with ANAT 309 in Fall Term. L. Postovit.

EXCLUSIONS: ANAT 311, ANAT 309, ANAT 831

### **BMED 832 Molecular Basis of Cell Function**

This course provides an introduction to the signaling pathways that regulate key cellular functions such as growth and motility. The biochemical and structural principles that underlie the regulation of enzyme and protein activity in cells are emphasized. Topics include protein kinases and phosphatases, ubiquitin modification, G protein coupled receptors, growth factor receptors, scaffold and adaptor proteins, Ras GTPases, phospholipases, oncogenes, cyclic nucleotides, phosphoinositides, isoprenoids and steroid hormones. Offered jointly with BCHM 432. Three lecture hours per week. Fall term; D. Maurice.

PREREQUISITE: BCHM 310, or BCHM 315 and BCHM 316 and BCHM 317 for BCHM students; BCHM 310, or BCHM 315 and BCHM 316 for LISC students (or equivalent).

EXCLUSIONS: BCHM 432, BCHM 431, BCHM 433, BCHM 831, BCHM 832, BCHM 833, BMED 831 .

### **BMED 833 Selected Topics in Mammalian Histology**

Detailed histological assessment of selected organs and tissues. Lectures and seminars. Not offered 2023-24.

PREREQUISITES: ANAT 215 and 216 or ANAT 311 or ANAT 309 or ANAT 831 or BMED 831.

EXCLUSION: ANAT 833

### **BMED 834 Principles and Techniques in the Teaching of Anatomical Sciences**

A series of lectures and workshops illustrating modern teaching philosophy and technique specifically designed for teaching Anatomy in the Health Sciences. Fall, Winter and Summer terms; L.W. MacKenzie.

EXCLUSION: ANAT 834

### **BMED 835 Advanced Prokaryotic Structure and Function**

In depth analysis of the genetics, biochemistry, assembly and function of the major structures of the prokaryotic cell. Emphasis on the experimental approaches in the current literature. (Offered in alternate years to BMED 836 and concurrently with MICR 435 with additional work required.) Fall term, two hours lecture, one hour tutorial. Not offered 2023-24.

EXCLUSION: MICR 835

### **BMED 836 Microbial Genetics**

A detailed description of the processes of heredity in bacteria including a discussion of gene structure and evolution, gene expression and its control, the exchange of genetic material in the microbial world and genetic engineering and its applications. The laboratory component will emphasize modern approaches to genetic engineering. (Offered in alternate years to BMED 835 and concurrently with MICR 436 with additional work required.) Not offered 2023-24.

EXCLUSION: MICR 836

### **BMED 840 Principles of General Pharmacology I**

Lectures, tutorial sessions, laboratory project, and self directed critical analysis of a current research area in Pharmacology. Topics include: principles of drug action, autonomic and autacoid pharmacology, and toxicology. 3 lecture hours and 3 laboratory hours. Not offered 2023-24. PREREQUISITE: Permission of the Graduate Program required.

EXCLUSIONS: PHAR 340, PHAR 840.

### **BMED 841 Current Topics in Biochemistry I**

This course will focus on protein structure and function with special emphasis on membrane proteins and selected soluble protein systems. The course will consist of lectures and presentations that will be organized around specific readings from the recent literature. A portion of the course will be devoted to membrane protein structure and function. Selected examples of structural and functional studies of soluble proteins will include enzymes and inhibitors; protein protein interactions; protein engineering; high throughput identification of enzyme substrates. Some instruction will be given in homology modeling and database analysis of gene products. Three hours per week, half course lectures and seminars. Fall term; P. Davies.

PREREQUISITE: BCHM 410 and BCHM 411 (or equivalent) and permission of coordinator.

EXCLUSION: BCHM 841

### **BMED 844 Gastrointestinal Physiology**

The mechanisms and regulation of motor, secretory, digestive and absorptive functions of the gastrointestinal tract are considered. Students will be required to prepare and present reviews of original literature. Fall/winter terms.(Enrolment in both terms is required to achieve credit.) One hour lecture/ week; 1 hour seminar alt. wks. M. Blennerhassett. Offered jointly with PHGY 444. Enrolment is limited. Not offered 2023-24.

PREREQUISITE: PHGY 214 or equivalent.

EXCLUSIONS: PHGY 444, PHGY 844

### **BMED 846 Advanced Biomedical Sciences**

An advanced course for graduate students in which directed studies are used to examine select areas of biomedical



science. Two hours seminar. Fall and/or Winter and/or Summer term. N. Magoski.

PREREQUISITE: Permission of the course coordinator required.

EXCLUSION: PHGY 836

### **BMED 847 Research Projects in Anatomy and Cell Biology**

An investigation into concepts and techniques in selected areas of research offered in the Department of Anatomy. Research projects carried out under the supervision of a staff member. Fall, Winter and Summer terms; Logan Bale and Staff.

EXCLUSION: ANAT 847

### **BMED 849 Principles of General Pharmacology II**

Lectures, tutorial sessions, laboratory projects, drug literature evaluation, and self directed critical analysis of a current research area in Pharmacology. Topics include: neuropsychopharmacology, cardiovascular renal pharmacology, agents acting on the endocrine system, and chemotherapy. 3 lecture hours and 3 laboratory hours. Winter term; N. Philbrook. Not offered 2023-24.

PREREQUISITE: Permission of the Graduate Program required.

EXCLUSIONS: PHAR 450, PHAR 850.

### **BMED 851 Selected Topics in Viral Pathogenesis**

The nature of selected animal virus groups and their interactions with the host in disease production with special emphasis on the pathogenesis of tumor and human immunodeficiency viruses will be considered. (Offered concurrently with MICR 451 with additional work required). Two lecture hours, two seminars hours, one tutorial hour. Winter term; C. Colpitts.

EXCLUSIONS: MICR 451, MICR 851.

### **BMED 852 Virus Infection and Immunity**

The molecular basis for virus pathogenesis including the host immune response to virus infection, and viral countermeasures. Emphasis will be on viral infections that result in gastrointestinal, haematological, neurological, and respiratory disease. Tutorials will focus on discussion of current and seminal literature. Offered jointly with MICR 452. Fall term; B. Banfield.

PREREQUISITES: MICR 221, MICR 360/860 or BMED 877 or equivalents.

EXCLUSIONS: MICR 452, MICR 852

### **BMED 853 Cellular and Molecular Cardiovascular Sciences**

An advanced inter disciplinary course studying the anatomy, pharmacology and physiology of the cardiovascular system at the molecular and cellular level. The course is comprised

of lectures, discussion and student seminars based on recent literature. 3 hour seminar. Equivalent of CRSS 456. Winter term; D.H. Maurice.

PREREQUISITE: Undergraduate degree in Life Science or equivalent or permission from department.

EXCLUSIONS: ANAT 853 , PHAR 853 , PHGY 853 , CRSS 456.

### **BMED 854 Cardiovascular Sciences**

A study of the anatomy, pharmacology and physiology of the cardiovascular system based on lectures, seminars, laboratories and selected readings (same as PHAR 854 and PHGY 854). Topics include structure function of the heart and blood vessels, mechanisms of signal transduction, drug effects on second messenger systems, the cardiac pump, integrated cardiovascular control, arterial oxygen transport, control of blood pressure and hypertension. Offered jointly with LISC 454. Additional work prescribed for graduate students. Enrolment limited. Lectures, seminars and laboratories. Fall term; M. Adams

PREREQUISITE: OR COREQUISITES: ANAT 311, ANAT 309 , PHAR 340/450 and PHGY 312 or their equivalent.

EXCLUSIONS: ANAT 854 , PHAR 854 , PHGY 854 , LISC 454 .

### **BMED 855 Respiratory Physiology**

An advanced course examining respiratory mechanics, gas exchange, acid base balance and the neural control of breathing. Students are required to prepare and present reviews of literature and interpret results of laboratory experiments. 2 hours lecture/seminar or 6 hours laboratory. Offered jointly with PHGY 355. Winter term; N. Domnik.

PREREQUISITE: A minimum of C (2.0) in PHGY 214 or equivalent.

EXCLUSION: PHGY 855 , PHGY 355

### **BMED 860 Fundamentals of research**

The objective of this course is to expose graduate students to the fundamental issues involved in academic research, including safety, ethics, statistics, command of the literature and drafting of a research proposal. Fall term; K. Gee.

EXCLUSION: NSCI 800

### **BMED 862 Cellular techniques**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used in cell culture models for biomedical and molecular sciences research. (Weight= 1.5 credit units). Winter term; D. Maurice.

### **BMED 863 Protein and peptide analysis**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used for protein and peptide analysis involved in biomedical research. (Weight= 1.5 credit units). Winter term; G. Côté. Not offered 2023-24.

### **BMED 864 Nucleic acid analysis**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used for nucleic acid analysis involved in biomedical and molecular sciences research. (Weight= 1.5 credit unit). Winter term; Y. Tse.

### **BMED 865 Cell imaging analysis**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used for cell imaging analysis involved in biomedical and molecular sciences research. (Weight= 1.5 credit unit.). Summer term; P. Lima

### **BMED 866 Bioinformatics**

This course provides hands on training in analytical methods for extracting and interpreting biologically relevant information from various biomedical datasets. Through a combination of lectures and labs, we will cover hypotheses driving "BIG DATA" research and computing methods for testing these hypotheses using examples of real biomedical datasets. (Offered jointly with CISC 875). Fall term; Q. Duan  
EXCLUSION: CISC 875

### **BMED 867 In vivo laboratory techniques**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used in in vivo laboratory techniques. (Weight= 1.5 credit unit.) Fall term; T. Ozolins. Not offered 2023-24.

### **BMED 868 Clinical neuroscience methods**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used in clinical neuroscience methods involved in biomedical research. (Weight= 1.5 credit unit). Not offered 2023-24.  
EXCLUSION: NSCI 868

### **BMED 869 Methods in Reproduction**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used in reproductive and developmental biology involved in biomedical and molecular sciences research. (Weight= 1.5 credit unit) Fall term; C. Tayade. Not offered 2023-24.

### **BMED 870 Analysis of Small Molecules**

The objective of this course is to familiarize graduate students with the principles and practice of cutting edge technologies used for the analysis of small molecules involved in biomedical and molecular research. (Weight= 1.5 credit unit). Not offered 2023-24.

### **BMED 877 Immunology**

The general principles and mechanisms of immune reaction. Immunochemical and immunobiological aspects of antibody formation and cell mediated immunity in health and disease will be considered. (Offered concurrently with MICR 360 with additional work required.) Winter term; S. Basta  
EXCLUSION: MICR 860

### **BMED 878 Microbial Pathogenesis**

A comprehensive course emphasizing the major microbial and viral groups occurring in human and animal disease. The basic mechanisms involved in host parasite interrelationships as well as current effective methodology used in their control will be studied. Fall term. N. Martin. Not offered 2023-24.  
EXCLUSION: MICR 920

### **BMED 879 Advanced Bacteriology**

Advanced studies in contemporary bacteriology emphasizing important topics through analysis of the current literature in oral and written formats. Three seminar hours. Fall term; K. Jarrell. Not offered 2023-24.  
EXCLUSION: MICR 930

### **BMED 881 Advanced Immunology**

An advanced course emphasizing the main areas of contemporary immunology. Fall term; S. Basta.  
EXCLUSION: MICR 960

### **BMED 882 Proteomics and Metabolomics**

'Omics' technologies allow the components of a living organism to be appreciated in their entirety by providing insight into gene expression, protein synthesis and function, and metabolic networking. This course builds upon concepts presented in undergraduate courses by covering the basic principles of proteomics and metabolomics and their application in the new systems biology 'omics' approach to scientific discovery. This course will emphasize both the methodologies used in proteomics and metabolomics, as well as their applications in both research and medical diagnostic settings. Coursework will be completed primarily online as modules, interactive discussions, and assignments. An individual in person presentation/seminar will be required. Offered jointly with BCHM 482. PREREQUISITES: BCHM 315/3.0 and BCHM 316/3.0, or BCHM 310/9.0 or equivalent. Winter Term, R. Campbell.  
EXCLUSION: BCHM 482

### **BMED 889 Practicum**

EXCLUSION: ANAT 889

### **BMED 894 Neuroendocrinology**

An in depth study of selected topics in neuroendocrinology (neural control of endocrine and autonomic function) and neuroendocrine techniques focusing on primary literature underlying critical advances over the past 40 years. Students learn to critically evaluate scientific literature. Instructional



format is primarily student led seminars. (Offered odd years; jointly with PHGY 494). Winter term; A. Ferguson. Not offered 2023-24.

PREREQUISITE: PHGY 214 or equivalent. Program option.

EXCLUSION: PHGY 494

#### **BMED 897 Research Seminars**

The objective of this course is to expose graduate students to cutting edge research and provide them the opportunity to deliver research seminars in a clear and concise fashion. This course spans a two-year period. Fall, Winter, and Summer. K. Gee.

#### **BMED 898 Master's Independent Project Report**

As a component of the curriculum for the Pattern II Program in Anatomical Sciences, students will complete an independent studies project under the supervision of departmental faculty member. Students will summarize their work in a written report that will be reviewed by a committee and orally defended.

EXCLUSION: ANAT 898

#### **BMED 899 Master's Thesis Research**

EXCLUSIONS: ANAT 899, BCHM 899, MICR 899, PHAR 899, PHGY 899

#### **BMED 999 Ph.D. Thesis Research**

EXCLUSIONS: ANAT 999, BCHM 999, MICR 999, PHAR 999, PHGY 999