

# Biochemistry (BIOC)

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## Biochemistry (BIOC) Courses

### BIOC 2200 [0.5 credit]

#### Cellular Biochemistry

Cellular functions and their interrelationships. Introduction to thermodynamics, membrane structure and function, transport mechanisms, basic metabolic pathways, energy production and utilization, communications between cells. It is strongly recommended that Biology Majors and Honours students take this course in their second year of study.

Includes: Experiential Learning Activity

Also listed as BIOL 2200.

Precludes additional credit for BIOL 2201.

Prerequisite(s): (BIOL 1003 and BIOL 1004) or (BIOL 1103 and BIOL 1104), (CHEM 1006 or CHEM 1002) or permission of the Institute. It is strongly recommended that students in Biochemistry programs take this course in their second year of study.

Lectures three hours a week, laboratory or tutorial four hours a week.

### BIOC 2300 [0.5 credit]

#### Physical Biochemistry

Energy of biological systems, molecular interactions, diffusion principles, introduction to protein folding, structure and thermodynamics, ligand binding and nucleic acid structures; experimental design and data management.

Precludes additional credit for CHEM 2103.

Prerequisite(s): BIOC 2200 (can be taken concurrently with BIOC 2300) and MATH 1007 and MATH 1107, and (PHYS 1007 and PHYS 1008) or (PHYS 1003 and PHYS 1004).

Lectures three hours a week, tutorials three hours a week.

### BIOC 2400 [0.5 credit]

#### Independent Research I

Students carry out a laboratory research project under the supervision of a faculty member from the Institute of Biochemistry. A research report must be submitted by the last day of classes for evaluation by the Director and Faculty supervisor.

Includes: Experiential Learning Activity

Prerequisite(s): restricted to Honours students of second-year standing in a Biochemistry program with a GPA of 10.0 or higher in first year, and approval of the Director and a Faculty supervisor.

Laboratory research for at least three hours a week over two terms.

### BIOC 3008 [0.5 credit]

#### Bioinformatics

A practical exploration in the application of information technology to biochemistry and molecular biology. Insight into biological knowledge discovery via molecular structure and function prediction, comparative genomics and biological information management.

Includes: Experiential Learning Activity

Also listed as BIOL 3008 and COMP 3308.

Prerequisite(s): BIOC 2200 or BIOL 2200; or permission of the Institute.

Lecture two hours a week, computer workshop three hours a week.

### BIOC 3101 [0.5 credit]

#### General Biochemistry I

Chemistry, structure and function of proteins, lipids, carbohydrates and nucleic acids. Monomers, linkages and types of biochemical polymers that are formed. Mechanism of action of enzymes, regulatory control mechanisms of proteins and integration of biochemical pathways.

Precludes additional credit for CHEM 3401.

Prerequisite(s): (BIOC 2200 or BIOL 2200), and (CHEM 2203 and CHEM 2204) or (CHEM 2207 and CHEM 2208) or permission of the Institute.

Lectures three hours a week.

### BIOC 3102 [0.5 credit]

#### General Biochemistry II

Anabolic and catabolic processes. Regulation of cell compartment (membranes, mitochondria, chloroplast, peroxisome, nuclei) composition. Genetic controls of transcription, translation and post-translational modification of protein structure and function. Biochemical processes of disease, development, and toxicology.

Prerequisite(s): BIOC 3101 and BIOL 2104.

Lectures three hours a week.

### BIOC 3103 [0.5 credit]

#### Practical Biochemistry I

Introduction to experimental biochemistry and the theory and concepts dealt with in BIOC 3101, and BIOC 3202.

Includes: Experiential Learning Activity

Precludes additional credit for BIOC 3006 (no longer offered).

Prerequisite(s): (BIOC 2200 or BIOL 2200) and CHEM 2203 or permission of the Institute. CHEM 2204 and (BIOC 2300 or CHEM 2103) are also recommended. It is highly recommended that BIOC 3101 and BIOC 3202 be taken concurrently.

Laboratory four hours a week, tutorial one hour per week.

**BIOC 3104 [0.5 credit]****Practical Biochemistry II**

Introduction to experimental biochemistry and the theory and concepts dealt with in BIOC 3101, BIOC 3102, and BIOC 3202.

Includes: Experiential Learning Activity

Precludes additional credit for BIOC 3006 (no longer offered).

Prerequisite(s): BIOC 3103. It is highly recommended that BIOC 3102 be taken concurrently.

Laboratory four hours a week, tutorial one hour a week.

**BIOC 3202 [0.5 credit]****Biophysical Techniques and Applications**

Theory and applications of current biochemical/biophysical instrumentation and techniques including biophysical spectroscopy, molecular structure determination, calorimetry, and mass spectrometry.

Precludes additional credit for BIOC 4002.

Prerequisite(s): BIOC 2200 or permission of the Institute.

Lectures three hours a week.

**BIOC 3203 [0.5 credit]****Biochemical Pharmacology**

Biochemical principles of pharmacology, including receptor mechanisms, signal transduction, pharmacokinetics, and pharmacodynamics. Genome-wide association studies, pharmacogenomics, and personalized medicine will also be included.

Prerequisite(s): BIOC 2200 or BIOL 2200, or permission of the Institute.

Lectures three hours a week.

**BIOC 3400 [0.5 credit]****Independent Research II**

Students carry out a laboratory research project under the supervision of faculty member from the Institute of Biochemistry. A research report must be submitted by the last day of classes for evaluation by the Director and Faculty supervisor.

Includes: Experiential Learning Activity

Prerequisite(s): restricted to Honours students of third-year standing in a Biochemistry program with a GPA of 10.0 or higher in second year, and approval of the Director and Faculty supervisor.

Laboratory research for at least three hours a week over two terms.

**BIOC 3999 [0.0 credit]****Co-operative Work Term**

Practical experience for students enrolled in the co-operative option. Students must receive a satisfactory evaluation from their work term employer; and present a written report describing their work term project. Graded Sat or Uns.

Includes: Experiential Learning Activity

Prerequisite(s): registration in the Biochemistry co-operative option and permission of the Institute.

**BIOC 4001 [0.5 credit]****Methods in Biochemistry**

Principles and applications of modern biochemical methodology, including ultracentrifugation, electrophoresis, ELISA, EMSA, experimental planning, ligand binding kinetics, fluorescence spectroscopy, affinity purification, and in vitro translation.

Includes: Experiential Learning Activity

Prerequisite(s): BIOC 3103 and BIOC 3104 or permission of the Institute.

Lectures and discussion two hours, laboratory four hours a week.

**BIOC 4004 [0.5 credit]****Industrial Biochemistry**

The application of biochemistry to the production of biological compounds useful in nutrition, medicine, and the food and chemical industries. General strategies for efficient production of these compounds by controlling the activities of living cells or enzymes.

Prerequisite(s): BIOC 3101 and BIOC 3102 (BIOC 3102 may be taken concurrently), or permission of the Institute.

Lecture three hours a week.

**BIOC 4005 [0.5 credit]****Biochemical Regulation**

Regulation at the transcriptional, translational and metabolic level; regulation of cell and subcellular organelle function and other timely topics may be included.

Prerequisite(s): BIOC 3101 and BIOC 3102.

Lectures three hours a week.

**BIOC 4007 [0.5 credit]****Membrane Biochemistry**

Biochemical and biophysical aspects of biomembrane structure and function. Topics may include: membrane lipids and proteins, lipid polymorphism, model membranes, liposomes, membrane biogenesis, the membrane cytoskeleton, membrane trafficking, membrane fusion, exocytosis and signal transduction across membranes.

Prerequisite(s): BIOL 2200 or BIOC 2200, or BIOC 3101 (which may be taken concurrently with BIOC 4007), or permission of the Institute.

Lectures two hours a week and workshop two hours a week.

**BIOC 4008 [0.5 credit]****Computational Systems Biology**

Modeling and simulation of metabolic and regulatory networks towards understanding complex and highly dynamic cellular systems. Biotechnological applications include metabolic engineering, synthetic biology, and drug discovery.

Includes: Experiential Learning Activity

Also listed as COMP 4308.

Prerequisite(s): BIOC 3101 or permission of the Institute.

Lecture one and a half hours per week, workshop one and a half hours per week.

**BIOC 4009 [0.5 credit]****Biochemistry of Disease**

The biochemical basis of disease including genetic and metabolic disorders such as cancer, neurological degenerative conditions, diabetes, stroke and microbial infections.

Prerequisite(s): BIOC 3101 and BIOC 3102, or permission of the Institute.

Lectures three hours a week.

**BIOC 4200 [0.5 credit]****Immunology**

The organization and function of the immune system, including the anatomy of the immune system, the properties and behaviour of cells of the immune system, and the molecular and genetic bases of the immune response.

Also listed as BIOL 4200.

Prerequisite(s): BIOL 3201 or permission of the Institute.

Lectures three hours a week.

**BIOC 4201 [0.5 credit]****Advanced Cell Culture and Tissue Engineering**

Theory and application of current techniques and developments in cell culture as applied to research questions in the field of stem cells and tissue engineering. Includes: Experiential Learning Activity

Also listed as BIOL 4201.

Prerequisite(s): BIOL 3201 or permission of the Institute.

Laboratory four hours per week, tutorial one hour a week.

**BIOC 4202 [0.5 credit]****Mutagenesis and DNA Repair**

A mechanistic study of mutagenesis and DNA repair. Topics include DNA structure perturbations, spontaneous and induced mutagenesis, the genetics and biochemistry of DNA repair and recombination, and the role of mutations in the development of genetic disease and cancer.

Also listed as BIOL 4202.

Prerequisite(s): BIOL 3104 and BIOL 2200/BIOC 2200, or permission of the Institute.

Lectures and tutorial three hours a week.

**BIOC 4203 [0.5 credit]****Advanced Metabolism**

Structure, biochemical derivation and function of secondary metabolites such as toxins and antibiotics.

Examples from plant, fungal and animal systems.

Prerequisite(s): BIOC 3101 and BIOC 3102, or permission of the Institute.

Lectures three hours a week.

**BIOC 4204 [0.5 credit]****Protein Biotechnology**

An advanced lecture, discussion and seminar course covering the theory, development and current techniques of protein and enzyme engineering. Topics to be discussed may also include applications in biotechnology, nanotechnology and new frontiers in basic and applied research.

Precludes additional credit for BIOC 4002.

Prerequisite(s): BIOC 3101 and BIOC 3202 (may be taken concurrently), or permission of the Institute.

Lectures two hours a week, workshop two hours a week.

**BIOC 4708 [0.5 credit]****Principles of Toxicology**

Basic theorems of toxicology with examples of current research problems. Toxic risk is defined as the product of intensive hazard and extensive exposure. Each factor is assessed in scientific and social contexts and illustrated with many types of experimental material.

Prerequisite(s): BIOC 3101 and fourth-year standing or permission of the Institute.

Also offered at the graduate level, with different requirements, as BIOL 6402, CHEM 5708, for which additional credit is precluded.

Lectures three hours a week.

**BIOC 4901 [0.5 credit]****Selected Topics in Biochemistry**

Selected topics of current interest in biochemistry are offered upon approval by the Director in consultation with members of the Institute.

**BIOC 4906 [1.0 credit]****Interdisciplinary Research Project**

Collaborative, interdisciplinary research project approved by the Director. Requires co-supervision, with at least one faculty member from the Institute of Biochemistry. Evaluation is based on a written thesis and poster presentation.

Includes: Experiential Learning Activity

Precludes additional credit for BIOC 4907 and BIOC 4908.

Prerequisite(s): (BIOC 3103 and BIOC 3104) and (BIOC 3101 and BIOC 3102) or equivalent, eligibility to continue in Honours Biochemistry or in Biochemistry and Biotechnology, permission of the Institute.

**BIOC 4907 [1.0 credit]****Honours Essay and Research Proposal**

An independent research study using library or computational resources. The candidate will prepare a critical review of a topic approved by a faculty adviser. Evaluation will be based on a written report and a poster presentation of the project.

Includes: Experiential Learning Activity

Precludes additional credit for BIOC 4906 [1.0] and BIOC 4908 [1.0].

Prerequisite(s): fourth-year standing in an Honours Biochemistry program and permission of the Institute.

**BIOC 4908 [1.0 credit]****Research Project**

Students carry out a research project approved by the Director, under the supervision of a faculty member of the Institute, in either the Biology or Chemistry departments. Evaluation is based on a written thesis and poster presentation.

Includes: Experiential Learning Activity

Precludes additional credit for BIOC 4906 and BIOC 4907.

Prerequisite(s): (BIOC 3103 and BIOC 3104) and (BIOC 3101 and BIOC 3102) or equivalent, and eligibility to continue in Honours Biochemistry or in Biochemistry and Biotechnology.