

# MICROBIOLOGY (MBIO)

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## **MBIO 1010 Microbiology I 3 cr**

(Lab required) Topics will include the definition and history of microbiology, concepts of practical microbiology, prokaryotic cell structure, prokaryotic specialization in gene expression and transfer of genetic information, the role of microbes in environments including the human body, and applications of microbiology to food production and biotechnology. May not be held with MBIO 1011.

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

Prerequisites: [BIOL 1020 or BIOL 1021] and [one of CHEM 1100, CHEM 1101, the former CHEM 1300, or the former CHEM 1301].

**Equiv To:** MBIO 1011

**Mutually Exclusive:** MBIO 1220, MBIO 2100, MBIO 2101, MBIO 2110, MBIO 2111

**Attributes:** Science, Recommended Intro Courses

## **MBIO 1220 Essentials of Microbiology 3 cr**

An introduction to the essential principles of microbiology including immunity, with emphasis on microbial disease. Not available to students who have previously obtained credit in or are currently enrolled in MBIO 1010 or MBIO 1011 (or the former MBIO 2100 or MBIO 2101). NOTE: MBIO 1220 is intended for students planning to enter the College of Nursing or other health care or related programs. Students that have completed MBIO 1010 but wish to take MBIO 1220 to satisfy Faculty of Nursing entrance requirements must obtain departmental permission prior to registering for MBIO 1220. MBIO 1220 cannot be used to satisfy the requirements of the Microbiology Honours or Major degree programs. MBIO 1220 can be used as an elective course in any Science program.

**Mutually Exclusive:** MBIO 1010, MBIO 1011, MBIO 2100, MBIO 2101

**Attributes:** Science, Recommended Intro Courses

## **MBIO 1410 Introduction of Molecular Biology 3 cr**

An introduction to the mechanisms, themes and patterns that are present in the molecular biology of organisms ranging from bacteria to humans. The basic applications of molecular biology to disciplines such as medical microbiology, criminology, genetic fingerprinting, genome sequencing, and bioinformatics will be discussed. NOTE: MBIO 1410 is intended for students outside of Microbiology and Biological Sciences who require an introduction to molecular biology, such as those with interests in bioinformatics, biophysics, or bioengineering. Although this course may be used as an elective in an Arts or Science program, it may not be used to meet a program requirement for an Honours or Major program in Microbiology. Not available to students who have previously obtained credit in, or are currently enrolled in the following courses: the former MBIO 2410, BIOL 2500, BIOL 2501, MBIO 2020, MBIO 2021, the former MBIO 2100, MBIO 2101, MBIO 3410 or MBIO 3411.

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

Prerequisite: one of grade 12 Biology, grade 12 Chemistry, BIOL 1000, CHEM 1000, or higher level Chemistry or Biology course; or consent of department.

**Mutually Exclusive:** BIOL 2500, BIOL 2501, MBIO 2020, MBIO 2021, MBIO 2100, MBIO 2101, MBIO 2410, MBIO 3410, MBIO 3411

**Attributes:** Science, Recommended Intro Courses

## **MBIO 2020 Microbiology II 3 cr**

(Lab required) Topics will include bacterial growth, chromosome replication, the specifics of transcription and translation and their application to the regulation of microbial gene expression. Families of bacterial and animal viruses, their modes of reproduction and pathogenicity will be discussed. Mutation and gene transfer in bacteria will be introduced. May not be held with MBIO 2021, the former MBIO 2110, or the former MBIO 2111.

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

Prerequisites: [MBIO 1010 or MBIO 1011] and [((CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126)) or (the former CHEM 1310 or the former CHEM 1311 or the former CHEM 1320)].

**Equiv To:** MBIO 2021

**Mutually Exclusive:** MBIO 1410, MBIO 2110, MBIO 2111

**Attributes:** Science

## **MBIO 2230 Introductory Biogeochemistry 3 cr**

The roles and interactions of biological, chemical and geological reactions in determining the composition of the environment. Microorganisms as major agents of biogeochemical change and their roles in the element cycles will be especially emphasized.

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

Prerequisites: [one of CHEM 1110, CHEM 1111, the former CHEM 1310, or the former CHEM 1311] and [one of MBIO 1010, MBIO 1011, BIOL 1030, or BIOL 1031].

**Attributes:** Science

## **MBIO 2420 Introductory Virology 3 cr**

An introduction to the general principles of eukaryotic virology, with emphasis on animal virus systems. These principles will be reinforced and expanded to deal with specific viruses that cause acute and chronic infections in humans. Topics to be discussed include the molecular structure of viruses; the basic multiplication strategies of the major virus families; mechanisms of host immune evasion and viral latency, persistence, and oncology.

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

Prerequisites: (MBIO 1010 or MBIO 1011) and (BIOL 2520 or BIOL 2521).

**Attributes:** Science

## **MBIO 2700 Biochemistry 1: Biomolecules and an Introduction to Metabolic Energy 3 cr**

An introductory course dealing with the kinds of molecules encountered in biochemistry, and the concept of metabolic energy as a product of catabolism and a requirement for biosynthesis. Also offered as CHEM 2700. May not be held with the former MBIO 2360, the former MBIO 2361, MBIO 2701, MBIO 2730, the former MBIO 2770, the former CHEM 2360, the former CHEM 2361, CHEM 2700, CHEM 2701, CHEM 2730, the former CHEM 2860, or the former CHEM 2770.

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

Prerequisites: [(CHEM 1110 or CHEM 1111) and (one of CHEM 1120, CHEM 1121, or CHEM 1126) or (the former CHEM 1310 or the former CHEM 1311)] and [BIOL 1030 or BIOL 1031].

**Equiv To:** CHEM 2700, CHEM 2701, MBIO 2701

**Mutually Exclusive:** CHEM 2360, CHEM 2361, CHEM 2730, CHEM 2770, CHEM 2860, MBIO 2360, MBIO 2361, MBIO 2730, MBIO 2770

**Attributes:** Science

**MBIO 2710 Biochemistry 2: Catabolism, Synthesis, and Information Pathways 3 cr**

An introductory course dealing with the basic metabolic processes that occur in living cells, including the production and use of metabolic energy, the breakdown and synthesis of biomolecules; the synthesis of DNA, RNA and proteins; and the regulation of these processes. Also offered as CHEM 2710. May not be held with the former MBIO 2370, the former MBIO 2371, MBIO 2711, MBIO 2750, the former MBIO 2780, the former CHEM 2370, the former CHEM 2371, CHEM 2710, CHEM 2711, CHEM 2750, or the former CHEM 2780.

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

Prerequisites: [one of MBIO 2700, MBIO 2701, the former MBIO 2360, the former MBIO 2361, CHEM 2700, CHEM 2701, the former CHEM 2360, the former CHEM 2361, or the former CHEM 2860] and [one of CHEM 2100, CHEM 2101, the former CHEM 2210, or the former CHEM 2211].

**Equiv To:** CHEM 2710, CHEM 2711, MBIO 2711

**Mutually Exclusive:** CHEM 2370, CHEM 2371, CHEM 2750, CHEM 2780, MBIO 2370, MBIO 2371, MBIO 2750, MBIO 2780

**Attributes:** Science

**MBIO 2730 Elements of Biochemistry 1 3 cr**

Basic concepts of biochemistry including the properties of biomolecules (amino acids and proteins, enzymes, carbohydrates, lipids, and nucleic acids) and aspects of energy production in cells. Primarily for students in Agricultural and Food Sciences and four-year Biological Sciences programs in Science. May not be used as part of an Honours, Major, or Minor program in Chemistry. May not be used as part of an Honours or Major program in Microbiology. This course is also given in Chemistry as CHEM 2730. May not be held with the former CHEM 2360, the former CHEM 2361, CHEM 2700, CHEM 2701, CHEM 2730, the former CHEM 2770, the former CHEM 2860, the former MBIO 2360, the former MBIO 2361, MBIO 2700, MBIO 2701, or the former MBIO 2770.

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

Prerequisites: [one of CHEM 1110, CHEM 1111, CHEM 1130, the former CHEM 1310, the former CHEM 1311, or the former CHEM 1320] and [six credit hours of university level BIOL courses or (HEAL 1500 and HEAL 1502)].

**Equiv To:** CHEM 2730

**Mutually Exclusive:** CHEM 2360, CHEM 2361, CHEM 2700, CHEM 2701, CHEM 2770, MBIO 2360, MBIO 2361, MBIO 2700, MBIO 2701, MBIO 2770

**Attributes:** Science

**MBIO 2750 Elements of Biochemistry 2 3 cr**

The continuation of CHEM 2730/MBIO 2730, dealing with nitrogen and lipid metabolism, representative biosynthetic pathways, and synthesis and importance of DNA, RNA and proteins. Primarily for students in Agricultural and Food Sciences and four-year Biological Sciences programs in Science. May not be used as part of an Honours, Major, or Minor program in Chemistry. May not be used as part of an Honours or Major program in Microbiology. This course is also given in Chemistry as CHEM 2750. May not be held with the former CHEM 2370, the former CHEM 2371, CHEM 2710, CHEM 2711, CHEM 2750, the former CHEM 2780, the former MBIO 2370, the former MBIO 2371, MBIO 2710, MBIO 2711, or the former MBIO 2780.

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

Prerequisites: one of CHEM 2730, CHEM 2700, CHEM 2701, the former CHEM 2770, the former CHEM 2360, the former CHEM 2361, the former CHEM 2860, MBIO 2730, MBIO 2700, MBIO 2701, the former MBIO 2770, the former MBIO 2360, or the former MBIO 2361.

**Equiv To:** CHEM 2750

**Mutually Exclusive:** CHEM 2370, CHEM 2371, CHEM 2710, CHEM 2711, CHEM 2780, CHEM 2860, MBIO 2370, MBIO 2371, MBIO 2710, MBIO 2711, MBIO 2780

**Attributes:** Science

**MBIO 3000 Applied Biological Safety 3 cr**

A comprehensive overview of applied biological safety in research and industrial environments and the disease-causing features of relevant infectious agents and considerations for their containment.

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

Prerequisites: [MBIO 1010 or MBIO 1011] and [one of CHEM 1110, CHEM 1111, CHEM 1130, the former CHEM 1310, the former CHEM 1311, or the former CHEM 1320]; or permission of instructor.

**Attributes:** Science

**MBIO 3010 Mechanisms of Microbial Disease 3 cr**

A consideration of host-parasite relationships, an introduction to the immune response, microbial pathogenesis, viral diseases, clinical microbiology and public health, and an introduction to antimicrobial agents. May not be held with MBIO 3011.

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

Prerequisites: MBIO 2020 (MBIO 2021) or the former MBIO 2100 or former MBIO 2101.

**Equiv To:** MBIO 3011

**Attributes:** Science

**MBIO 3032 Microbiology III: Physiology and Metabolism 3 cr**

The course will include an introduction to microbial growth and genomics approaches used for the analysis of microbial metabolism. Using these tools, the physiology of microbial cell walls, transport, and motility, as well as microbial metabolism as related to ATP production, respiration, fermentation and carbon fixation will be discussed. May not be held with the former MBIO 3030, the former MBIO 3031, or MBIO 3033.

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

Prerequisites: [MBIO 2020 or MBIO 2021] and [one of MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, or the former CHEM 2371].

**Equiv To:** MBIO 3033

**Mutually Exclusive:** MBIO 2100, MBIO 2101, MBIO 3030, MBIO 3031

**Attributes:** Science

**MBIO 3282 Microbial Communities 3 cr**

The course will examine microbial communities, which will be discussed in terms of their composition, physiological adaptations and their effects on their abiotic and biological surroundings. Topics will include nutrient cycling, biodegradation and adaptation to extreme environments, and the applications arising from these microbial functions. Methods for quantitation of microbial biomass and biological activity will be discussed. May not be held with MBIO 3283, the former MBIO 2280, or the former MBIO 3280.

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

Prerequisites: [MBIO 1010 or MBIO 1011] and [one of CHEM 1110, CHEM 1111, the former CHEM 1310, or the former CHEM 1311]. MBIO 2020, MBIO 2021, or MBIO 1410 are recommended prerequisites.

**Equip To:** MBIO 3283

**Mutually Exclusive:** MBIO 2280, MBIO 3280

**Attributes:** Science

**MBIO 3410 Molecular Biology 3 cr**

A rigorous treatment of the foundations of modern day molecular biology as it pertains to molecular disease, gene and cell manipulation, and cellular controls. May not be held with MBIO 3411.

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

Prerequisites: [one of MBIO 2700, MBIO 2701, CHEM 2700, CHEM 2701, MBIO 2730, CHEM 2730, the former MBIO 2360, the former MBIO 2361, the former CHEM 2360, the former CHEM 2361, the former MBIO 2770, or the former CHEM 2770], and [one of MBIO 2020, MBIO 2021, BIOL 2520, BIOL 2521, BIOL 2500, BIOL 2501, or PLNT 2520].

**Equip To:** MBIO 3411

**Mutually Exclusive:** MBIO 1410

**Attributes:** Science

**MBIO 3430 Molecular Evolution 3 cr**

An analysis starting with prebiotic evolution, progressing through the elaboration of macromolecules and examining their adaptation to their function as cellular components. Proteins, carbohydrates, and nucleic acids as structural, catalytic, and genetic elements in evolution of living systems.

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

Prerequisite: one of MBIO 2020, MBIO 2021, MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, the former CHEM 2371, MBIO 2750, the former MBIO 2780, CHEM 2750, the former CHEM 2780, BIOL 2500, BIOL 2501, PLNT 2520, BIOL 2520, or BIOL 2521.

**Attributes:** Science

**MBIO 3450 Regulation of Biochemical Processes 3 cr**

Mechanisms of regulation of enzyme activity, including allostery, control of selected biosynthetic and degradative pathways and regulation of gene expression. May not be held with MBIO 3451.

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

Prerequisites: [MBIO 2020 or MBIO 2021] and [one of MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, or the former CHEM 2371]; or consent of the department.

**Equip To:** MBIO 3451

**Attributes:** Science

**MBIO 3460 Membrane and Cellular Biochemistry 3 cr**

(Lab required) Isolation, fractionation, structure and function of cellular membranes and subcellular components. The central role of these elements in the biochemistry of cellular processes will be stressed. May not be held with MBIO 3461.

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

Prerequisites: [(one of MBIO 2710, MBIO 2711, CHEM 2710, CHEM 2711) and (CHEM 2720 or CHEM 2721)] or [one of the former MBIO 2370, the former MBIO 2371, the former CHEM 2370, or the former CHEM 2371].

**Equip To:** MBIO 3461

**Attributes:** Science

**MBIO 3472 Microbial Systematics 3 cr**

Characterization and classification of the major group of microorganisms. Bases for divisions and the relatedness among organisms will be studied. May not be held with the former MBIO 3470.

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

Prerequisites: one of MBIO 3032, MBIO 3033, the former MBIO 3030, or the former MBIO 3031.

**Mutually Exclusive:** MBIO 3470

**Attributes:** Science

**MBIO 3600 Molecular Microbiology Techniques 3 cr**

A laboratory-based course, intended to teach the fundamental techniques required to work in a modern molecular microbiology laboratory. Students will develop a thorough understanding of the theory underpinning the techniques introduced in this course, laboratory skills in current molecular microbiology techniques, and application of techniques to investigate scientific questions, such as the identification of unknowns. Learning outcomes include development of technical skills, competency in following protocols, presentation of results and scientific writing. May not be held with MBIO 3601, the former MBIO 4600, the former MBIO 4601, or MBIO 4030 when titled Advanced Microbial Genetics Lab.

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

Prerequisites: [MBIO 3410 or MBIO 3411]; and [(MBIO 2710, MBIO 2711, CHEM 2710, or CHEM 2711) and (CHEM 2720 or CHEM 2721)] or [one of the former MBIO 2370, the former MBIO 2371, the former CHEM 2370, or the former CHEM 2371].

**Equip To:** MBIO 3601

**Mutually Exclusive:** MBIO 4030, MBIO 4600, MBIO 4601

**Attributes:** Science

**MBIO 3700 Experimental Microbiology Laboratory 3 cr**

This lab course will introduce students to the morphological and physiological study of microorganisms. Students will reinforce their basic lab skills while carrying out discovery-based experiments involving microscopy, antibiotic susceptibility testing, bacterial enumeration, physiology and identification. May not be held with the former MBIO 3030 or the former MBIO 3031.

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

Prerequisites: MBIO 2020 or MBIO 2021; and [(MBIO 2700, MBIO 2701, CHEM 2700, or CHEM 2701) and (CHEM 2720 or CHEM 2721)] or [one of the former MBIO 2370, the former MBIO 2371, the former CHEM 2370, or the former CHEM 2371].

**Mutually Exclusive:** MBIO 3030, MBIO 3031

**Attributes:** Science

**MBIO 3980 Work Term 1 0 cr**

Work assignments in business, industry or government for students registered in the Microbiology Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).

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

Prerequisite: MBIO 2370 (MBIO 2371) or CHEM 2370 (CHEM 2371).

**Attributes:** Science

**MBIO 3990 Work Term 2 0 cr**

Work assignments in business, industry or government for students registered in the Microbiology Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).

**Attributes:** Science

**MBIO 4020 Immunology 3 cr**

Topics will include antigens, antibodies, antigen-antibody reactions, immunogenetics, regulation of immune reactions, complement, hypersensitivities, autoimmunity, immunodeficiencies, transplantation and tumour immunology. May not be held with the former MBIO 4010, the former MBIO 4011, or MBIO 4021.

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

Prerequisite: one of MBIO 3010, MBIO 3011, MBIO 3410 (B), or MBIO 3411 (B).

**Equiv To:** MBIO 4021

**Mutually Exclusive:** MBIO 4010, MBIO 4011

**Attributes:** Science

**MBIO 4030 Special Topics in Microbiology 3 cr**

Microbiology is a very broad field that encompasses a wide range of specialized topics. In this course, students can pursue a specific topic in detail through lectures, assigned readings, seminars and research projects. The course is normally restricted to third and fourth year Honours and Major students. Topics to be covered by the course shall be decided by the instructor(s) in consultation with the student(s) and with the approval from the Department. Grades are based on written assignments and reports. Evaluation may also include oral presentation and poster presentation(s).

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

Prerequisite: Consent of Department.

**Mutually Exclusive:** MBIO 3600, MBIO 3601, MBIO 4300, MBIO 4700

**Attributes:** Science

**MBIO 4032 Special Topics in Microbiology 3 cr**

(Lab required) Microbiology is a very broad field that encompasses a wide range of specialized topics. In this course, students can pursue a specific topic in detail through laboratory-based research projects and may include lectures, assigned readings, and presentation of seminars. The course is normally restricted to third and fourth year Honours and Major students in Microbiology, Biochemistry, and Genetics. Topics to be covered by the course shall be decided by the instructor(s) in consultation with the student(s) and with the approval from the Department.

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

Prerequisite: Consent of Instructor.

**Attributes:** Science

**MBIO 4300 Infectious Diseases Around the World 3 cr**

This course will build upon MBIO 3010. The course will cover the different influential factors such as climate, travel, poverty and socio-economic conditions, government and religion, and how they impact the prevention, spread and treatment of key infectious disease in different parts of the world. May not be held with MBIO 4030 when titled Infectious Diseases around the World.

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

Prerequisite: MBIO 3010 or MBIO 3011.

**Mutually Exclusive:** MBIO 4030

**Attributes:** Science

**MBIO 4410 Virology 3 cr**

A comprehensive examination of fundamental properties of viruses, virus taxonomy, and the different ways in which viruses replicate. The ways viruses cause disease and experimental methods used in virology also will be examined. May not be held with MBIO 4411.

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

Prerequisites: [MBIO 3010 or MBIO 3011] and [MBIO 3410 or MBIO 3411] and [one of MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, or the former CHEM 2371].

**Equiv To:** MBIO 4411

**Attributes:** Science

**MBIO 4442 Research in Systems Microbiology 3 cr**

(Lab required) Systems microbiology integrates physiological information and functional genomics (genomics, transcriptomics, proteomics, metabolomics) data, as well as large scale mutagenesis and chemogenomics to create models of the complex interactions within microbial cells to understand how a bacterial cell functions as an integrated whole. Applications to more complex microbial communities will also be discussed. May not be held with the former MBIO 4440.

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

Prerequisites: one of MBIO 3032, MBIO 3033, the former MBIO 3030, or the former MBIO 3031.

**Mutually Exclusive:** MBIO 4440

**Attributes:** Science

**MBIO 4480 Microbes in our Environment 3 cr**

(Lab required) A course investigating the diversity of roles microbes play in our immediate environment, and how they affect it. Environments to be examined may include the human body, waste treatment facilities and extreme environments. Molecular tools to study the community structure and roles of individual organisms will also be discussed. May not be held with the former MBIO 3480 or the former MBIO 4320.

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

Prerequisites: one of [(MBIO 3032 or MBIO 3033) and MBIO 3700] or (the former MBIO 3030, or the former MBIO 3031).

**Mutually Exclusive:** MBIO 3480, MBIO 4320

**Attributes:** Science

**MBIO 4520 Industrial Bioprocesses 3 cr**

(Lab required) The course will cover bioprocesses for a range of commercially important healthcare and industrial products. Topics will also include bioreactor design and control for these bioprocesses, metabolic engineering for product enhancement, applied engineering and downstream processing. May not be held for credit with the former MBIO 4510.

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

Prerequisites: one of [(MBIO 3032 or MBIO 3033) and MBIO 3700] or (the former MBIO 3030, or the former MBIO 3031).

**Mutually Exclusive:** MBIO 4510

**Attributes:** Science

**MBIO 4530 Project in Microbiology 6 cr**

(Lab required) A research project chosen in consultation with the course administrator and supervised by a faculty member. A written report is normally required. The course is available only to final year Honours students in Microbiology, Biochemistry, or the Genetics program. May not be held with CHEM 4710, CHEM 4711, MBIO 4531, or BGEN 4010.

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

Prerequisite: Permission of course administrator.

**Equiv To:** MBIO 4531

**Mutually Exclusive:** BGEN 4010, BTEC 4000, CHEM 4710, CHEM 4711

**Attributes:** Science

**MBIO 4540 Biological Energy Transduction 3 cr**

Biochemistry of biological processes involving interconversion of different forms of energy such as oxidative phosphorylation, membrane transport and contractile processes. May not be held with MBIO 4541. MBIO 3032, MBIO 3033, the former MBIO 3030, or the former MBIO 3031 is recommended as a prerequisite to this course.

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

Prerequisite: one of MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, or the former CHEM 2371.

**Equiv To:** MBIO 4541

**Attributes:** Science

**MBIO 4602 Molecular Genetics of Prokaryotes - Lectures 3 cr**

A detailed examination of genetic mechanisms of replication, expression, mutability, repair and transposition of DNA in bacteria and their viruses, and their applications in recombinant DNA technology. The contribution of these genetic mechanisms to virulence in bacterial pathogens will also be examined. May not be held with MBIO 4603, the former MBIO 4600, or the former MBIO 4601.

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

Prerequisites: [MBIO 2020 or MBIO 2021] and [MBIO 3410 or MBIO 3411].

**Equiv To:** MBIO 4603

**Mutually Exclusive:** MBIO 4600, MBIO 4601

**Attributes:** Science

**MBIO 4612 Molecular Genetics of Eukaryotes - Lectures 3 cr**

A comprehensive study dealing with replication and expression of DNA, genome structure, and the involvement of genes in diseases such as cancer. May not be held with MBIO 4613 or the former MBIO 4610.

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

Prerequisites: [MBIO 3410 or MBIO 3411] and [one of MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, or the former CHEM 2371].

BIOL 2500 or BIOL 2501 is recommended.

**Equiv To:** MBIO 4613

**Mutually Exclusive:** MBIO 4610

**Attributes:** Science

**MBIO 4672 Applied Molecular Biology 3 cr**

The overall objective of this course is to introduce and describe the current molecular techniques and their application to biological problems. These include, but are not limited to, basic gene cloning, mutagenesis and over-expression. May not be held with the former MBIO 4570, MBIO 4670, the former MBIO 4580, MBIO 4581.

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

Prerequisites: [MBIO 3410 or MBIO 3411] and [one of MBIO 2710, MBIO 2711, the former MBIO 2370, the former MBIO 2371, CHEM 2710, CHEM 2711, the former CHEM 2370, or the former CHEM 2371].

**Mutually Exclusive:** MBIO 4570, MBIO 4580, MBIO 4581, MBIO 4670

**Attributes:** Science

**MBIO 4700 Computational Molecular Microbiology 3 cr**

The introduction to bioinformatics concepts achieved by applying computational tools to analyse sequence/molecular data relevant to Microbiology. The course will introduce existing bioinformatics tools that deal with biological databases, sequence alignment, gene and protein structure prediction, molecular phylogenetics, genomics and proteomics. May not be held with MBIO 4030 when the topic was Applied Bioinformatics Resources for Microbial Based Research.

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

Prerequisite: MBIO 3410 (B) or MBIO 3411 (B).

**Mutually Exclusive:** MBIO 4030

**Attributes:** Science

**MBIO 4980 Work Term 3 0 cr**

Work assignments in business, industry or government for students registered in the Microbiology Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).

**Attributes:** Science

**MBIO 4990 Work Term 4 0 cr**

Work assignments in business, industry or government for students registered in the Microbiology Honours or Major Cooperative program. Requires submission of a written report covering the work completed during the four-month professional assignment. (Pass/Fail grade only).

**Attributes:** Science