

## Course list

### MICB 301 (3) **Microbial Ecophysiology**

Dynamics and control of prokaryotic cellular processes in response to the biotic and abiotic environment including metabolic interactions and metabolic cooperation between microorganisms. [3-0-1]

*Prerequisite:* All of BIOL 201, MICB 201.

### MICB 302 (3) **Immunology**

Cells, molecules, and mechanisms of innate and adaptive immunity. Antigen presenting cells and the major histocompatibility complex, T and B lymphocytes and their antigen receptors, T and B cell development, innate and adaptive immune responses against pathogens, diseases associated with aberrant immune responses. [3-0-1]

*Prerequisite:* MICB 202 and third-year standing.

### MICB 306 (3) **Molecular Virology**

Introduction to virus structure and replication. Detailed examination of selected viruses including polio, HIV and cancer-causing retroviruses. Development of vaccines and anti-viral drugs, the use of virus vectors to cure genetic diseases. [3-0-1]

*Prerequisite:* MICB 202.

### MICB 308 (3) **Paradigms in Bacterial Pathogenesis**

Mechanisms of bacterial pathogenesis including adherence, invasion, intracellular survival, toxins, host defenses and microbial evasion strategies, antibiotics, and vaccines. Introduction to experimental approaches used to study bacterial pathogens. [3-0-0]

*Prerequisite:* All of BIOL 201, MICB 202.

### MICB 318 (3) **Biological Process Engineering**

Design and modeling of single and multi-species bioreactors, industrial fermentation and product recovery systems. (Consult the Credit Exclusion list within the Faculty of Science section of the Calendar.) [3-0-2]

*Prerequisite:* Either (a) SCIE 001 or (b) BIOL 112 and one of MATH 100, MATH 102, MATH 104, MATH 180, MATH 184. Third-year standing or higher is required by all students.

### MICB 322 (3) **Molecular Microbiology Laboratory**

Aseptic handling and characterization of microbes, growth properties, enzyme assays, protein analysis and plasmid isolation. Restricted to students in Microbiology and Immunology specializations. [2-4-0]

*Prerequisite:* All of BIOL 200, BIOL 201, CHEM 233, MICB 201, MICB 202.

### MICB 323 (3) **Molecular Immunology and Virology Laboratory**

Genetic manipulations of bacteria, introductory immunological and virological procedures, tissue culture. Restricted to students in Microbiology and Immunology specializations. [2-4-0]

*Prerequisite:* MICB 322.

### MICB 325 (3) **Microbial Genetics**

Plasmids, phage and cloning vectors, gene transfer, genetic maps, genetic analysis of microbial gene expression.

*Prerequisite:* One of MICB 201, BIOL 234, BIOL 334 and third-year standing

### MICB 353 (1) **Food Microbiology Laboratory**

Procedures and principles associated with isolation, enumeration, characterization and handling of microorganisms. Restricted to students registered in the Food Science program. [1-2-0]

*Prerequisite:* One of BIOL 112, MICB 201, SCIE 001.

### MICB 401 (3) **Environmental Microbiology Laboratory**

Microbiological analysis using culture, microscopic, gene characterization, chemical and immunological techniques. [2-4-0]

*Prerequisite:* MICB 322 and MICB 301.

**MICB 402 (3) Advanced Immunology**

Molecular basis of lymphocyte development, activation and adhesion; immunogenetics and the major histocompatibility complex. Consult the credit exclusion list within the Faculty of Science section of the calendar. [3-0-1]

*Prerequisite:* MICB 302. A standing of at least 68% in MICB 302 is recommended.

*Corequisite:* One of BIOL 234, BIOL 334, BIOL 335, MICB 325.

**MICB 404 (3) Topics in Molecular Bacterial Pathogenesis**

A lecture/discussion/library research course. Topics such as antibiotic resistance, pathogen genomics; host-pathogen interactions; evolution of pathogens; host responses to infection, invasive mechanisms, resistance mechanisms. [1-0-4]

*Prerequisite:* MICB 302 and one of MICB 308, MICB 403, MICB 408.

**MICB 405 (3) Bioinformatics**

Computational methods to analyze genome and protein sequences to derive structural and functional information. Related topics in functional genomics. [3-0-1]

*Prerequisite:* One of MICB 301, MICB 324, MICB 325, BIOC 300, BIOC 302, BIOC 303, BIOL 335.

**MICB 406 (3) Topics in Molecular Virology**

Presentations, library research, paper reviews, class discussions about current research in virology. Topics such as molecular targets in viral therapy; chronic viral infection; virus-host cell interaction. [1-0-4]

*Prerequisite:* MICB 306.

**MICB 407 (3) Viral Infections in Humans**

Interactions between viruses and humans; pathogenesis; persistence and viral oncogenesis; virological diagnosis and treatment. (Consult the Credit Exclusion list within the Faculty of Science section of the Calendar.) [3-0-0]

*Prerequisite:* MICB 306.

**MICB 408 (3) Advanced Bacterial Pathogenesis**

Current and emerging themes in bacterial pathogenesis including cellular microbiology, bacterial cell biology processes and their role in virulence including secretion systems to deliver virulence factors and immune evasion strategies employed by pathogens. Development of antibiotics and resistance to antibiotics. [3-0-0]

*Prerequisite:* MICB 308. MICB 302 and MICB 325 are recommended.

**MICB 412 (3) Topics in Immunological Research**

Presentations, library research, paper reviews and class discussion on selected areas of advanced molecular and cellular immunological research. [1-0-4]

*Prerequisite:* MICB 302 and one of MICB 402, MEDG 410.

**MICB 418 (3) Industrial Microbiology and Biotechnology**

Exploitation of microbial and animal cells for the industrial production of chemicals ranging from alcohol to therapeutic proteins. Genetic manipulation of cellular characteristics, fermentation methods, patenting and governmental approval processes. [3-0-0]

*Corequisite:* One of BIOL 335, MICB 325.

**MICB 421 (3) Experimental Microbiology**

Research in microbial physiology and molecular genetics. Guided and independent laboratory projects are developed. [2-4-0]

*Prerequisite:* One of MICB 323, BIOT 380.

**MICB 424 (3) Cellular Dynamics of Pathogenic and Environmental Bacteria**

Regulatory and signalling networks in bacterial cells with emphasis on how cellular and environmental cues are detected and integrated during different growth or life history stages of important pathogenic and environmental bacteria. [3-0-0]

*Prerequisite:* Either (a) MICB 301 or (b) all of MICB 201, MICB 325.

**MICB 425 (3) Microbial Ecological Genomics**

Intrinsic and extrinsic forces driving prokaryotic genome evolution. Gene transfer; microbial species concepts; community genome structure, function and dynamics; ecological impacts of microbial genome diversity. Emphasis on problem solving and experimental design. [3-3-0]

*Prerequisite:* One of BIOL 335, MICB 325. One of MICB 201 or MICB 301 is recommended.

**MICB 502 (3) Advanced Immunogenetics**

Consult the Credit Exclusion List in the Faculty of Science section of the Calendar. *This course is not eligible for Credit/D/Fail grading.*

**MICB 503 (3) Bacterial Cytology and Genetics**

*This course is not eligible for Credit/D/Fail grading.*

**MICB 505 (3) Molecular Microbiology**

*This course is not eligible for Credit/D/Fail grading.*

**MICB 506 (3/6) d Microbiological and Immunological Research**

Developing, discussing, and undertaking research projects. Oral communication skills, peer review skills, scientific ethics, and the ability to critically evaluate papers in the literature. To be taken only with permission of the department head. *This course is not eligible for Credit/D/Fail grading.*

**MICB 507 (3) Topics in Molecular Pathogenesis and Immunology**

*This course is not eligible for Credit/D/Fail grading.*

**MICB 508 (3) Molecular Genetics of Plant-Microbe Interactions**

Consult the Credit Exclusion List in the Faculty of Science section of the Calendar. *This course is not eligible for Credit/D/Fail grading.*

**MICB 548 (6) Directed Studies on an Approved Problem**

*This course is not eligible for Credit/D/Fail grading.*

**BIOC 402 (3) Proteins: Structure and Function**

Structural components of proteins, classification by primary, secondary and tertiary structure, protein chemistry and purification, peptide and protein synthesis by chemical means and three-dimensional structure determination using X-ray diffraction and NMR. [3-0-0]

*Prerequisite:* One of BIOC 300, BIOC 302, BIOC 303. A minimum standing of 65% is recommended in these courses.

**BIOC 403 (3) Enzymology**

Kinetic analysis, catalytic mechanisms, transition state stabilization and regulation of activity, strategies for active site characterization and case studies of well-documented enzyme systems. Credit given for only one of BIOC 403, CHEM 413 or CHEM 569. [3-0-0]

*Prerequisite:* BIOC 402. A minimum standing of 65% is recommended.

**BIOC 404 (3) Biochemical Methods**

Theory and application of classical and emerging technologies in biochemical research. Emphasis on using primary literature and oral presentation skills. Restricted to Honours students in Biochemistry or others with permission of the instructor. [1-0; 2-0]

**BIOC 410 (3) Nucleic Acids-Structure and Function**

Chemical, physical and biological properties of nucleic acids and their role in replication, transcription, translation and regulation of expression of genetic material. Credit will not be given for both BIOC 410 and 510. [3-0-0]

*Prerequisite:* All of BIOC 303, BIOL 335. A minimum standing of 65% is recommended in these courses.

**BIOC 420 (3) Advanced Biochemical Techniques**

Multi-week experiments in areas of contemporary biochemistry research using classical and modern techniques. Emphasis on experimental design, technique, critical analysis of data, and scientific communication skills. Restricted to Honours students in Biochemistry and others with permission of the instructor. [0-6-0]

*Corequisite:* BIOC 404.

**BIOC 421 (3) Recombinant DNA Techniques**

Multi-week experiments involving contemporary nucleic acid research, cloning and recombinant protein engineering. Emphasis is on experimental design, critical analysis of data and scientific communication skills. Restricted to Major students in Biochemistry. [0-6-0]

*Prerequisite:* All of BIOC 301, BIOC 410.

**BIOC 440 (3) Concepts in Molecular Biology**

Developing areas of molecular biology, focusing on experimental design and data analysis. Signal transduction, the use of model eukaryotes, and the regulation of gene expression. [3-0-0]

*Prerequisite:* All of BIOC 303, BIOC 402, BIOC 410.

**BIOC 448 (3/6) c Directed Studies in Biochemistry**

A library (3 credits) or a laboratory project with written report (3 or 6 credits) allowing a student to undertake an investigation on a specific topic as agreed upon by the faculty and student.

*Prerequisite:* Permission of the Department Head is required.

**BIOC 449 (3/6) c Honours Thesis**

A research problem under the direction of a faculty member. Restricted to Honours students.

**BIOC 450 (3) Membrane Biochemistry**

Biochemistry of membranes and membrane proteins, membrane fusion, electrical signaling, and the involvement of membrane proteins in disease and drug development. [3-0-0]

*Prerequisite:* All of BIOC 303, BIOC 402, BIOC 410.

**BIOC 460 (3) Advanced Techniques in Biochemistry**

Theoretical basis and practical applications of a selection of advanced techniques currently used in biochemical research. Topics will vary. [3-0-0]

*Prerequisite:* All of BIOC 303, BIOC 402, BIOC 410.

**BIOC 509 (3) Membrane Structure and Function**

The physical properties and functional roles of lipids in membranes, liposomes, membrane permeability; membrane function; structure, biosynthesis and cell sorting of membrane proteins; and the structure-function relationships of channels, transporters and receptors. Given in alternate years. *This course is not eligible for Credit/D/Fail grading.* [3-0]

**BIOC 510 (3) Nucleic Acids: Structure and Function**

Structure and function of nucleic acids and their role in replication, transcription, translation and expression of genetic information. Credit will not be given for both BIOC 410 and 510. *This course is not eligible for Credit/D/Fail grading.* [3-0]

**BIOC 511 (3) Biochemical Aspects of Cellular Regulation**

A lecture and discussion course on the molecular basis of cellular regulation with special emphasis on mammalian cells. Mechanisms involved in the responses of cells to adrenergic, steroid and peptide hormones and growth factors. Regulation of the concentration and specific activity of key enzymes, transport systems and structural proteins. Given in alternate years. *This course is not eligible for Credit/D/Fail grading.* [3-0]

**BIOC 514 (3) Advanced Topics in Protein Chemistry**

Topics will include contemporary theoretical and experimental investigation of protein structure-function relationships. Topics will vary. Given in alternate years. *This course is not eligible for Credit/D/Fail grading.* [3-0]

**BIOC 521 (3) Advanced Topics in Molecular Biology**

Discussions based on topics in the current literature. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* One of BIOC 410, BIOC 510.

**BIOL 402 (3) Aquatic Ecology**

Theoretical and applied limnology; ecology of inland water organisms in relation to physical, chemical and biological factors. One weekend field trip required. [2-4-0]

*Prerequisite:* One of BIOL 300, STAT 200 and one of BIOL 230, BIOL 302, BIOL 303, BIOL 304.

**BIOL 404 (3) Ecological Methodology**

Design, execution, and analysis of ecological surveys and experiments. Practical field methods for estimating population metrics and describing community structure. Computer techniques for the statistical analysis of ecological data. [2-4-0]

*Prerequisite:* One of BIOL 300, STAT 200 and one of BIOL 230, BIOL 302, BIOL 303, BIOL 304.

**BIOL 408 (6) Principles of Applied Ecology**

Principles of animal and community ecology applicable to the management of animal resources; application of statistical and computer techniques for measuring, analyzing, modelling, and simulating resource systems; problems of multiple resource use. [2-2-0]

*Prerequisite:* BIOL 300.

**BIOL 410 (3) Current Topics in Animal Behaviour**

Lectures and seminar discussions on selected topics in animal behaviour. [2-0-2]

*Prerequisite:* BIOL 310. Permission of the head of Zoology is also acceptable.

**BIOL 411 (3) Insect Ecology**

Behavioural, population and community ecology of insects. Interactions between insects and plants and the application of the principles of insect ecology to biological control of insects and weeds. [3-0-0]

*Prerequisite:* Either (a) BIOL 205 or (b) all of AGRO 327, BIOL 327.

**BIOL 417 (3) Phylogenetic Biology**

Biodiversity from an evolutionary perspective. The evolutionary (phylogenetic) tree of genetic descent that links all organisms: its reconstruction, interpretation, and implications for fields from ecology to molecular biology. [2-0-2]

*Prerequisite:* BIOL 200 and one of BIOL 234, BIOL 334. BIOL 336 is recommended

**BIOL 418 (3) Evolutionary Ecology**

Ecological adaptation and evolutionary processes in contemporary populations; natural selection, variation, optimization, foraging theory, coevolution, arms races; life history theory, evolution of sex, sexual selection, evolution in managed populations. [2-2-0]

*Prerequisite:* BIOL 336 and one of BIOL 230, BIOL 303, BIOL 304.

**BIOL 420 (3) Ocean Conservation and Sustainability**

An interdisciplinary conservation course with a solutions-oriented approach to marine issues, drawing from natural sciences, social sciences, business, law, and communication. *This course is not eligible for Credit/D/Fail grading.* [2-0-3]

Fourth-year standing.

**BIOL 421 (3) Plant-Microbe Interactions**

Biology and physiology of selected plant-microbe relationships. Impacts of plant-microbe relationships on society. [3-0-2]

*Prerequisite:* BIOL 200 and one of BIOL 234, BIOL 260, BIOL 201.

*Equivalency:* APBI426

**BIOL 423 (3) Plant Stress Ecophysiology**

Molecular mechanisms of plant responses to extreme environments. Consult the Faculty of Science Credit Exclusion List: [www.students.ubc.ca/calendar/index.cfm?tree=12,215,410,414](http://www.students.ubc.ca/calendar/index.cfm?tree=12,215,410,414). [3-0-0]

*Prerequisite:* BIOL 351. BIOL 406 or 407 are recommended.

**BIOL 425 (3) Biomechanics**

An analytical approach to the study of skeletal mechanics and animal locomotion. Selected topics in the structure and properties of biological materials, the functional design of skeletons for locomotion, and the fluid mechanics of swimming and flight. [2-3-0]

*Prerequisite:* BIOL 325.

**BIOL 426 (3) Mammalogy**

Natural history, behavioral ecology and conservation of terrestrial mammals. The laboratory includes classification, life histories, and ecology, with particular attention to species from British Columbia. [2-3-0]

*Prerequisite:* BIOL 204.

**BIOL 427 (3) Ornithology and Herpetology**

Ecology, evolution, behavior, and conservation of birds, amphibians, and reptiles. Laboratories and field projects will focus on identification, systematics, and natural history, with particular attention to species from British Columbia. [2-3-0]

*Prerequisite:* BIOL 121.

**BIOL 430 (3) Genome Evolution**

Application of genetics and molecular biology to evolutionary problems. Emphasis on using macromolecular sequence information to answer questions about phylogeny and population structure, and on the evolutionary implications of recent discoveries in molecular genetics. [3-0-0]

*Prerequisite:* One of BIOL 335, BIOL 336.

**BIOL 431 (3) Advanced Cell Biology**

Ultrastructure, biogenesis and evolution of bacterial and eukaryotic cells and cell organelles, including their macromolecular basis. [3-3-0]

*Prerequisite:* BIOL 200. And fourth-year standing.

**BIOL 434 (3) Population Genetics**

Theoretical and experimental aspects of population and quantitative genetics. [3-0-2]

*Prerequisite:* BIOL 336 and either (a) all of BIOL 200, BIOL 234 or (b) one of BIOL 334, FRST 302.

**BIOL 436 (3) Integrated Functional Genomics**

Global transcript, protein, and metabolite profiling technologies and their integration; applications focus on plant functions and plant interactions with pathogens and pests. [3-0]

*Prerequisite:* BIOL 335.

*Equivalency:* FNH 436

**BIOL 437 (3) Laboratory in Animal Cell Molecular Biology**

The use of recombinant DNA techniques to explore problems in animal developmental biology. [2-4-0]

*Prerequisite:* All of BIOL 331, BIOL 335 and one of BIOL 201, BIOC 300, BIOC 302, BIOC 303.

Permission of the department head is also required.

**BIOL 438 (3) Zoological Physics**

Animal systems viewed from a physicist's perspective. Topics include sensory systems, energy budgets, locomotion, internal flows, physical advantages of grouping. [3-0-0]

*Prerequisite:* One of PHYS 101, PHYS 107. BIOL 325 is recommended.

*Equivalency:* PHYS438 (1994S)

**BIOL 441 (3) Animal Cell Biology**

Analysis of cellular organelles and the intracellular traffic between them, concentrating on mammalian cell systems. [3-0-0]

*Prerequisite:* All of BIOL 335, BIOL 360, BIOL 361 and one of BIOC 300, BIOC 302, BIOC 303.

*Corequisite:* BIOL 362. BIOL 331 is recommended.

**BIOL 450 (3) Molecular Adaptation of Animals to the Environment**

Physiological, biochemical, and molecular strategies of adaptation of animals to environmental challenges. The evolution of genetic and biochemical systems, and their impact on animal structure and function. [3-0-0]

*Prerequisite:* One of BIOL 362, BIOL 364 and one of BIOC 300, BIOC 302, BIOC 303. BIOL 454 is recommended.

**BIOL 455 (3) Comparative Neurobiology**

Current approaches in neurobiology, from the cellular to the behavioural level, are examined using representatives of vertebrate and invertebrate nervous systems. [3-0-2\*]

*Prerequisite:* One of BIOL 362, BIOL 364, PSYC 360.

**BIOL 456 (3) Comparative and Molecular Endocrinology**

A comparative study of vertebrate and invertebrate endocrinology. [3-0-0]

*Prerequisite:* BIOL 364.

**BIOL 457 (3) Comparative Environmental Physiology**

A survey of physiological adaptations of animals to different environments. [3-0-0]

*Prerequisite:* BIOL 364.

**BIOL 458 (3) Developmental Neurobiology**

Cellular, molecular and physiological aspects of nervous system development with applications to understanding adult nervous system function and neurological disorders. [3-0-0]

**BIOL 459 (3) Neurobiology of Sensory and Motor Systems**

Analysis of the mechanisms of sensory processing and motor orchestration using vertebrate and invertebrate model systems. Neural circuit structure, specialization, information coding, integration, and behaviour. [3-0-0]

*Prerequisite:* BIOL 455.

**BIOL 462 (3) Ecological Plant Biochemistry**

The structure, biosynthesis, distribution and biological function of secondary plant metabolites. [3-0-0]

*Prerequisite:* All of BIOL 200, BIOL 201. BIOL 209 or BIOL 210 is recommended.

*Equivalency:* FRST413

**BIOL 463 (3) Gene Regulation in Development**

Control of gene expression in development; the genetic and physiological basis of epigenetic determination; inductive interactions. [3-0-0]

*Prerequisite:* BIOL 335 and one of BIOC 300, BIOC 302, BIOC 303. BIOL 331 is recommended.

**BIOL 464 (3) Animal Developmental Genetics**

Role of genes in embryonic development. Emphasis on tissue specific expression patterns and the role of genetic networks in establishing cell types. [3-0-0]

*Prerequisite:* BIOL 463.

**BIOL 501 (3) Quantitative Methods in Ecology and Evolution**

*This course is not eligible for Credit/D/Fail grading. Prerequisite: BIOL 300 or equivalent and graduate student standing.*

**BIOL 509 (3) Population and Quantitative Genetics**

*This course is not eligible for Credit/D/Fail grading.*

**BIOL 510 (3) Applied Population Genetics**

*This course is not eligible for Credit/D/Fail grading. Equivalency: FRST535*

**BIOL 522 (3/6) d Topics in Marine Benthic Ecology**

*This course is not eligible for Credit/D/Fail grading.*

**BIOL 525 (2-6) d Topics in Systematics and Evolution**

*This course is not eligible for Credit/D/Fail grading.*

**BIOL 530 (3) The Biology of the Cell**

*This course is not eligible for Credit/D/Fail grading.*

**BIOL 535 (3) Teaching and Learning in the Life Sciences**

**EOSC 474 (3) Marine Pollution**

An interdisciplinary study of pollution, with examples drawn from coastal and oceanic environments, including areas of local interest. Intended for third and fourth year students with a background in the sciences. [3-0-0]

**EOSC 475 (3) Marine Microbiology**

Advanced biology, ecology and diversity of marine microbes. Emphasis on the roles of bacteria and viruses in marine foodwebs and geochemical cycles. [3-0-0]

*Prerequisite:* A minimum of 6 credits of third-year level life science courses.

**EOSC 476 (3) Estuaries**

An interdisciplinary study of the features and the physical, chemical, biological and geological processes in estuaries. [3-0-2\*]

*Prerequisite:* Either (a) EOSC 373 or (b) all of EOSC 370, EOSC 371. c) and fourth-year standing.

**EOSC 477 (3) Geophysical Fluid Dynamics**

The fundamental principles governing the flow of a density-stratified fluid on a rotating planet, with applications to the motions of the ocean and atmosphere. [3-0-2\*]

*Prerequisite:* One of PHYS 312, MATH 316.

*Equivalency:* ATSC414

**EOSC 511 (3) Numerical Techniques for Ocean, Atmosphere and Earth Scientists**

**GENE 501 (3) Genetics**

A lecture series intended to acquaint graduate genetics students and those in related areas with advances in genetics and an overview of genetics in a variety of systems. The emphasis is on molecular genetics. Optional for students in the graduate genetics program. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* All of BIOL 334, BIOL 335 or equivalent, and a third-year course in Biochemistry.

**GENE 502 (3) Genetics**

A lecture series intended to acquaint graduate genetics students and those in related areas with advances in genetics and an overview of genetics in a variety of systems. The emphasis is on eukaryotic genetics. Required of students in the graduate genetic program. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* All of BIOC 334, BIOC 335 or equivalent, and a third year course in Biochemistry.

This course is Web-based. Credit will not be granted for both ATSC 409 and ATSC 506/EOSC 511.

*This course is not eligible for Credit/D/Fail grading.*

*Equivalency:* ATSC506



*This course is not eligible for Credit/D/Fail grading.*

**BIOL 537 (3) Topics in Biotechnology**

Research reviews, class discussions, and presentations about current research in the diverse areas of biotechnology. Topics include the research interests of members of the UBC Biotechnology Laboratory. *This course is not eligible for Credit/D/Fail grading.* [1.5-0]

**BIOL 548 (2-6) c Advanced Topics in Biology**

*This course is not eligible for Credit/D/Fail grading.*

**MEDG 410 (3) Immunogenetics**

Molecular basis of lymphocyte development, activation and adhesion; immunogenetics and the major histocompatibility complex. Consult the Credit Exclusion list within the Faculty of Science section of the Calendar. [3-0-1]

*Prerequisite:* MICB 302 and one of BIOL 334, BIOL 335. A standing of "B" or better is recommended.

*Equivalency:* MICB402

**MEDG 419 (3) Developmental Origin of Human Disorders**

Genetic and epigenetic determinants of development from conception to birth. Topics include development of the neural tube, face, heart, endoderm, blastocyst, embryonic stem cells, gastrulation, genomic imprinting, placental complications, chromosomal abnormalities and prenatal diagnosis. Discussions based on published research articles. [3-0-1]

*Prerequisite:* One of BIOL 234, BIOL 334 and one of BIOL 331, BIOL 335. A standing of 'B' or higher recommended.

**MEDG 420 (3) Human Genomics and Medical Genetics**

Sequence and structure of the human genome. Human genetic evolution. Identification of genes affecting normal and pathological variation. Molecular mechanisms of genetic diseases and disorders. Medical applications of human genetics. [3-0-0]

*Prerequisite:* BIOL 335. A standing of 'B' or higher is recommended.

**MEDG 421 (3) Genetics and Cell Biology of Cancer**

Molecular mechanisms of oncogenes and tumor suppressors and the effects of oncogenic mutations on the biology of cancer cells. [3-0-0]

*Prerequisite:* BIOL 335 and one of BIOC 300, BIOC 302, BIOC 303, BIOL 350.

**MEDG 448 (3/6) d Directed Studies**

A supervised individual program of study of a topic to be agreed upon by a member of faculty and the student. Permission of the appropriate supervisor and the department head is required.

**MEDG 505 (3) Genome Analysis**

Investigation of genetic information as it is organized within genomes, genetic and physical map construction, sequencing technologies, gene identification, database accessing and integration, functional organization of genomes from contemporary, historic and evolutionary perspectives.

*This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* All of BIOL 334, BIOL 300.

**MEDG 510 (3) Advanced Immunogenetics**

Cell-cell interaction, intracellular control mechanisms, analysis of complex physiological systems using transgenic animals and molecular approaches. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Equivalency:* MICB502

**MEDG 515 (3) Mammalian Developmental Genetics**

Genetic determination of morphology and differentiation in human and other mammalian embryos. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* BIOL 335.

**MEDG 520 (3) Advanced Human Molecular Genetics**

Genetic variation, genome analysis, cloning of genes for diseases and normal functions, mutation detection, animal models of human genetic disease. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* BIOL 334.

**MEDG 521 (3) Molecular and Cell Biology of Cancer**

Focuses on molecular and cell biology of cancer through a series of lectures, reviews, student presentations and discussion. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* BIOL 334.

*Equivalency:* PATH531 (1989W)

**MEDG 525 (3) Medical Population Genetics**

Population genetics, genetic epidemiology and methodology in data analysis applicable to the study of human genes, traits or diseases. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* BIOL 335.

**MEDG 530 (3) Human Genetics**

Human Mendelian and non-Mendelian inheritance and clinical applications of genetics. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* BIOL 335.

**MEDG 535 (3) Genetics and Ethics**

This course is intended to serve the diverse needs of genetic counseling students, research graduate students in genetics, genetic residents and clinical fellows, other health professional students, and graduate students from other sciences and humanities. *This course is not eligible for Credit/D/Fail grading.* [3-0]

**MEDG 545 (3) Current Topics in Medical Genetics Research**

Critical discussion of current primary research literature in medical genetics. *This course is not eligible for Credit/D/Fail grading.*

**PATH 300 (6) Background to Medical Laboratory Science**

Introductory lectures and laboratory sessions in clinical chemistry, haematology and blood banking, hospital microbiology, preparation and examination of tissue sections. For Medical Laboratory Science students without previous experience in hospital laboratories. [3-4; 0-0]

*Prerequisite:* All of BIOL 112, BIOL 200, BIOL 201, CHEM 123, CHEM 205, CHEM 233, CHEM 235, MICB 202.

**PATH 301 (4) Basic and Physical Biochemistry for Medical Laboratory Scientists**

An integrated approach to specific areas of the theoretical and practical aspects of those physical and biological sciences relevant to medical laboratory science. Emphasis will be placed upon the application of basic science to those clinical disciplines practised by the medical laboratory scientist, e.g., histochemistry, clinical chemistry, microbiology, haematology, etc.

**PATH 303 (4) Cytogenetics, Tissue Culture & Cytology**

Tissue culture techniques in clinical diagnosis; cytological techniques used in the diagnosis and control of cancer. Sex chromatin determination.

**PATH 304 (4) Normal Human Histology**

An advanced lecture and laboratory course in the microscopic structure of the human body necessary for a complete understanding of histochemistry and histopathology.

**PATH 305 (4) Modern Microscopy**

A lecture and laboratory course in the theoretical and practical application of modern biological microscopes - compound, dissecting, comparison, dark ground, fluorescent, phase contrast, interference and electron microscopes.

**PATH 306 (2) Laboratory Safety for Medical Laboratory Scientists**

Control processes for workplace hazards of radiological, chemical, and biological origin.

**PATH 327 (6) Bacteriology, Mycology, Virology and Parasitology**

Descriptions of each group of human microbial pathogens according to biological attributes, clinical features, pathogenesis and pathology, epidemiology, immunological reactions, laboratory diagnosis, principles of antimicrobial therapy, preventative measures. For students in the Faculty of Medicine B.M.L.Sc.

**PATH 375 (3) Introduction to Human Pathology**

A lecture-demonstration course designed to acquaint students in the allied health professions with a basic understanding of the causes, natural history, and pathophysiology of common disease processes.

*Prerequisite:* 6 credits each first year BIOL and CHEM

**PATH 402 (4) Medical Laboratory Science: Haematology**

A theoretical and practical examination of those modern concepts of haematology which relate to the practice of medical laboratory science.

**PATH 404 (6) Diagnostic Histochemistry**

A lecture and laboratory course that encompasses the theory and the practice of currently available histochemical techniques. This course is to supplement the histopathological technique course taken as a requirement for CSLT (RT).

*Prerequisite:* Certification.

**PATH 405 (3) Seminars in Current Topics**

Oral and written presentation and critical appraisal of scientific papers.

**PATH 406 (6) Clinical Chemistry**

This course will review and discuss the methodology of clinical chemistry in order to put these analytical methods into the broad perspective of the pathophysiology of human disease and biochemistry.

**PATH 407 (3) Medical Laboratory Toxicology: Analytical, Clinical**

A theoretical and practical examination of analytical and pathophysiological aspects of clinical and forensic toxicology.

**PATH 408 (3) Laboratory Administration**

Personnel management, staff management relationships, stock control, record keeping, etc. Medicolegal aspects of medical laboratory science. Theory and practice of quality control. Use of computers in the medical laboratory.

**PATH 415 (2) Immunopathology**

Immunological events causing tissue injury.

**PATH 417 (3/6) c Human Bacterial Infections**

Students acquire content relating to the virulence factors of the bacteria and the pathophysiology of the host while working through case scenarios on their own and in online groups. Students taking this course must be willing to engage in both self-directed and small-group learning.

*Prerequisite:* MICB 202. Or equivalent.

**PATH 427 (3/3) Basic Principles of Infection Prevention and Control**

This course provides the basic principles to prevent the spread of microorganisms pathogenic to humans. It may be taken towards a Certificate in Infection Control.

**PATH 437 (3) Viral Infections in Humans**

Interactions between viruses and humans; pathogenesis; prompt virological diagnosis; rationale for antiviral chemotherapy and prophylaxis. [3-0-0]

*Equivalency:* MICB407

**PATH 451 (3) Clerkship in Laboratory Medicine and Infection Prevention and Control**

May involve attendance at an approved institution and/or a project assigned by the instructor(s). Instructor permission required. Enrolment may be limited.

**PATH 452 (3) Clerkship in Anatomic Pathology**

An elective course open to third-year medical students, designed to familiarize the student with Anatomic Pathology, including Surgical Pathology, Paediatric Pathology, Autopsy Pathology and Cytology. This elective may involve attendance at one or more affiliated hospitals. Registration requires consent of the Department and enrolment may be limited.

**PATH 453 (0) Clinical Laboratory Haematology**

Correlative seminars based on haematology case studies relating clinical features to laboratory investigations.

*Equivalency:* MEDI452 (1970W)

**PATH 457 (3) Clinical Laboratory Microbiology**

Selected clinical laboratory exercises plus seminars to illustrate the diagnosis and management of patients with microbial infections. Elective course limited to third- and fourth-year medical students.

*Prerequisite:* Departmental approval required.

**PATH 467 (3) Basic Microbiology for Infection Control**

The identification, clinical significance, and transmission of pathogenic organisms are presented. This course is available by correspondence or webCT. It may be taken towards fulfillment of the Certificate in Infection Control.

**PATH 477 (3) Basic Epidemiology for Infection Control**

Epidemiology, study, design and analysis, and outbreak investigation as it applies to institutional infection control.

*Equivalency:* HCEP401

**PATH 500 (2-6) d General Principles of Pathology**

Experimental pathology (2) and general principles of etiology, pathogenesis, disordered physiology and anatomic pathology of common disease processes. *This course is not eligible for Credit/D/Fail grading.*

**PATH 518 (2-4) c Pulmonary Pathophysiology**

A review of current topics in pulmonary pathophysiology at an advanced level suitable for graduate students majoring in pathology, medicine, surgery or anaesthesiology. Topics will include lung anatomy, ventilation, blood flow, gas and fluid exchange. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* One of PHYL 301, PHYL 303, PHYL 400.

**PATH 521 (3) Introduction to the Pathogenesis of Human Disease**

Current medical research; cardiovascular and pulmonary disease. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* Permission of instructor.

**PATH 523 (3) Principles of Antimicrobial Chemotherapy**

Classification, structure and mode of action of antimicrobial agents. In-depth comparison of factors affecting the activity of antimicrobials in vivo and in vitro. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* All of MICB 200, PATH 427.

**PATH 527 (2-4) d Bacteriology, Mycology, Virology and Parasitology**

All groups of microorganisms pathogenic for humans. Clinical features, pathogenesis and pathology, epidemiology, properties of the agents, immunology, laboratory diagnosis, therapy, preventative measures. *This course is not eligible for Credit/D/Fail grading.*

**PATH 530 (3) Nutrition and Metabolic Aspects of Human Disease**

Molecular effects of changes in nutrient status and metabolism on health. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* Restricted to students registered in the Pathology Graduate Program or instructor approval required.

**PATH 531 (3) Molecular and Cell Biology of Cancer**

This course focuses on molecular and cell biology of cancer and consists of a series of lectures/reviews combined with discussions and presentations by students on the topics selected by the instructors. Emphasis will be on students' presentations and discussion. *This course is not eligible for Credit/D/Fail grading.* [3-0]

*Prerequisite:* MEDG 421 is recommended. Course coordinator approval is required.

*Equivalency:* MEDG521 (1988W)

**PATH 547 (3) Techniques in Molecular Biology and Experimental Pathology**

Nucleic acid purification and characterization; restriction enzyme digests; northern and southern blotting; cloning; DNA sequencing; polymerase chain reaction technology; electron microscopy; fluorescein-activated cell sorting. *This course is not eligible for Credit/D/Fail grading.* [0-6]

**PATH 570 (3) Cardiovascular Pathophysiology**

Pathogenesis, abnormal physiology, and therapeutic approaches in heart disease including cardiac arrhythmia, heart failure, myocardial infarction, hypertension, atherosclerosis. *This course is not eligible for Credit/D/Fail grading.*

**PATH 582 (3) Toxicology III: Environmental Toxicology**

Toxicology and risk assessment of air, water and soil pollutants; food additives; animal and plant toxins; pesticides; heavy metals; solvents. *This course is not eligible for Credit/D/Fail grading.* [3-0-0]

*Equivalency:* PHAR582

**PATH 583 (3/4) d Toxicology IV: Molecular Mechanisms of Toxicology**

Activation versus detoxification by cytochromes P-450; the role of the Ah receptor; reactive oxygen species; heavy metals; apoptosis. *This course is not eligible for Credit/D/Fail grading.* [3-0-0]

*Equivalency:* PHAR583

**MEDG: Medical Genetics**

**MEDG 410 (3) Immunogenetics**

Molecular basis of lymphocyte development, activation and adhesion; immunogenetics and the major histocompatibility complex. Consult the Credit Exclusion list within the Faculty of Science section of the Calendar. [3-0-1]

*Prerequisite:* MICB 302 and one of BIOL 334, BIOL 335. A standing of "B" or better is recommended.

*Equivalency:* MICB402

**MEDG 419 (3) Developmental Origin of Human Disorders**

Genetic and epigenetic determinants of development from conception to birth. Topics include development of the neural tube, face, heart, endoderm, blastocyst, embryonic stem cells, gastrulation, genomic imprinting, placental complications, chromosomal abnormalities and prenatal diagnosis. Discussions based on published research articles. [3-0-1]

*Prerequisite:* One of BIOL 234, BIOL 334 and one of BIOL 331, BIOL 335. A standing of 'B' or higher recommended.

**MEDG 420 (3) Human Genomics and Medical Genetics**

- Sequence and structure of the human genome. Human genetic evolution. Identification of genes affecting normal and pathological variation. Molecular mechanisms of genetic diseases and disorders. Medical applications of human genetics. [3-0-0]  
*Prerequisite:* BIOL 335. A standing of 'B' or higher is recommended.
- MEDG 421 (3) Genetics and Cell Biology of Cancer**  
Molecular mechanisms of oncogenes and tumor suppressors and the effects of oncogenic mutations on the biology of cancer cells. [3-0-0]  
*Prerequisite:* BIOL 335 and one of BIOC 300, BIOC 302, BIOC 303, BIOL 350.
- MEDG 448 (3/6) d Directed Studies**  
A supervised individual program of study of a topic to be agreed upon by a member of faculty and the student. Permission of the appropriate supervisor and the department head is required.
- MEDG 505 (3) Genome Analysis**  
Investigation of genetic information as it is organized within genomes, genetic and physical map construction, sequencing technologies, gene identification, database accessing and integration, functional organization of genomes from contemporary, historic and evolutionary perspectives.  
*This course is not eligible for Credit/D/Fail grading.*  
*Prerequisite:* All of BIOL 334, BIOL 300.
- MEDG 510 (3) Advanced Immunogenetics**  
Cell-cell interaction, intracellular control mechanisms, analysis of complex physiological systems using transgenic animals and molecular approaches. *This course is not eligible for Credit/D/Fail grading.* [3-0]  
*Equivalency:* MICB502
- MEDG 515 (3) Mammalian Developmental Genetics**  
Genetic determination of morphology and differentiation in human and other mammalian embryos. *This course is not eligible for Credit/D/Fail grading.* [3-0]  
*Prerequisite:* BIOL 335.
- MEDG 520 (3) Advanced Human Molecular Genetics**  
Genetic variation, genome analysis, cloning of genes for diseases and normal functions, mutation detection, animal models of human genetic disease. *This course is not eligible for Credit/D/Fail grading.* [3-0]  
*Prerequisite:* BIOL 334.
- MEDG 521 (3) Molecular and Cell Biology of Cancer**  
Focuses on molecular and cell biology of cancer through a series of lectures, reviews, student presentations and discussion. *This course is not eligible for Credit/D/Fail grading.* [3-0]  
*Prerequisite:* BIOL 334.  
*Equivalency:* PATH531 (1989W)
- MEDG 525 (3) Medical Population Genetics**  
Population genetics, genetic epidemiology and methodology in data analysis applicable to the study of human genes, traits or diseases. *This course is not eligible for Credit/D/Fail grading.* [3-0]  
*Prerequisite:* BIOL 335.
- MEDG 530 (3) Human Genetics**  
Human Mendelian and non-Mendelian inheritance and clinical applications of genetics. *This course is not eligible for Credit/D/Fail grading.* [3-0]  
*Prerequisite:* BIOL 335.
- MEDG 535 (3) Genetics and Ethics**  
This course is intended to serve the diverse needs of genetic counseling students, research graduate students in genetics, genetic residents and clinical fellows, other health professional

students, and graduate students from other sciences and humanities. *This course is not eligible for Credit/D/Fail grading.* [3-0]

**MEDG 540 (3) Seminar**

All seminars will be presented by graduate students in the Department of Medical Genetics. Although students will be encouraged to attend these seminars throughout their graduate studies, credit will only be available for one year. *This course is not eligible for Credit/D/Fail grading.* [2-0]

**MEDG 545 (3) Current Topics in Medical Genetics Research**

Critical discussion of current primary research literature in medical genetics. *This course is not eligible for Credit/D/Fail grading.*

**CELL: Cell and Developmental Biology**

**CELL 501 (3) Cell and Developmental Biology Research Literature**

Development of written communication and critical thinking skills. *This course is not eligible for Credit/D/Fail grading.*

*Prerequisite:* BIOL 530.

**CELL 502 (1.5) Current Topics in Developmental Biology**

Cellular and molecular mechanisms of development from the earliest stages of axis formation to organogenesis. *This course is not eligible for Credit/D/Fail grading.*

**CELL 503 (1.5) Current Topics in Cellular Communication**

Cellular communication within tissues by direct contact and by modulating and responding to the microenvironment. *This course is not eligible for Credit/D/Fail grading.*

**CELL 504 (1.5) Current Topics in Cytoskeleton and Cell Motility**

Structure and function of the cytoskeleton, and its involvement in various forms of cell and intracellular motility. *This course is not eligible for Credit/D/Fail grading.*

**CELL 505 (1.5) Current Topics in Intracellular Trafficking**

Organization of membranes and organelles within cells and how molecules are targeted to intracellular sites. *This course is not eligible for Credit/D/Fail grading.*

**CELL 506 (1.5) Fluorescence Microscopy**

Principles and applications in biological research. *This course is not eligible for Credit/D/Fail grading.*

**CELL 507 (1.5) Special Techniques and Protocols in Cell and Developmental Biology**

*This course is not eligible for Credit/D/Fail grading.*

**CELL 508 (1.5) Molecular Genetic Analysis**

Methodologies and resources for genetic analysis of cellular function. *This course is not eligible for Credit/D/Fail grading.*

**CELL 509 (1.5) Cell Systems Biology**

The integration of basic cellular processes to produce a functioning cell. *This course is not eligible for Credit/D/Fail grading.*

**CELL 510 (1.5) Molecular Embryology**

Examination of the molecular interactions that underlie the later stages of embryological development. *This course is not eligible for Credit/D/Fail grading.*

**CELL 511 (1.5) Cellular and Molecular Mechanisms of Human Disease**

Cell biology in the age of evidence-based medicine. *This course is not eligible for Credit/D/Fail grading.*

**CELL 512 (1.5) Gene and Cell-based Therapies for Disease**

The development of gene and cell-based therapies and their translation into clinical use. *This course is not eligible for Credit/D/Fail grading.*

Additional useful courses taken or audited:

Stat 306

Stat 441

INDS 501

Stat 545A

BIOL 535

Stat 545

BIOF 540

Chem 517

BAEN 506 This course provides students with an experience-based introduction into the process of starting a company. Although traditionally most ventures in this course are technology based, proposals for non-technology ventures will also be considered. It is a real life simulation of the process that founders go through when starting a high-tech company. Students will be faced with the key issues involved in evaluating market opportunities, designing profitable business models, producing a solid business plan, raising capital, addressing legal considerations and developing a winning team. Students will gain the skills and tools to creatively commercialize high tech research into profitable businesses. Teams will be expected to develop credible pitches that will be made to professionals from industry.

Note: If you sign up for BAEN 506, you must take [BAEN 507](#) in the adjacent period. These modules are taught as one course and you will receive the same grade for both modules.

BAEN 506 and BAEN 507 will be held jointly with the Applied Science course APSC 541.