SECTION 16: UNDERGRADUATE COURSE DESCRIPTIONS

Each course description is followed by a list of the credit hours (cr) and contact hours for the course. Contact hours are divided into lecture (lec), laboratory (lab), tutorial (tut) and other (oth) hours. A course with a listing of 3 cr, 3 lec, 3 lab, 1 tut, 2 oth, is weighted at three credit hours with three hours of lectures, three laboratory hours, one hour of tutorial and two other contact hours per week.

Courses offered in condensed format will have the number of contact hours prorated accordingly.

Other notations in the course descriptions:

A cross-listed course is a single course that is listed under two or more faculties and identified by different course numbers. The course can be taken for credit from one faculty only.

A credit restriction occurs where two or more courses are closely related and credit is limited to one of the courses.

BIOL 1010U Biology I: Molecular and Cellular Systems. This course examines the evolutionary basis of life at the cellular level. Topics will include the basic structure and function of cells, cell energetics and respiration, photosynthesis, the structure and function of DNA, the control of gene expression, cell division and the evolution of multicellularity. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisites: OAC or 4U Biology (recommended). Credit restriction: BIOL 1840U. Note: Students without the biology prerequisite will be responsible for making up background material.

BIOL 1020U Biology II: Diversity of Life and Principles of Ecology. This course explores the diversity of fungi, plants and animals. It addresses the evolutionary relationships of these organisms and how each is uniquely adapted to survive and reproduce. The second half of the course introduces the main concepts and principles of ecology and gives a basic understanding of populations and communities. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: BIOL 1010U.

BIOL 1810U Biochemistry for Health Science. This course focuses on enzyme mechanisms and stereochemistry, and includes discussions of carbohydrate metabolism, glycolysis, glycogen breakdown and synthesis, transport across membranes, the citric acid cycle, electron transport and oxidative phosphorylation, the pentose phosphate pathway and the glycoxylate pathway, lipid metabolism, including fatty acid degradation and biosynthesis, and the synthesis and role of ketone bodies, amino acid metabolism, and an overview of the urea cycle. 3 cr, 3 lec, 2 tut (biweekly). Credit restriction: BIOL 2040U.

BIOL 1840U Biology for Engineers. This course examines the evolutionary basis of life and the structure and function of living organisms. The major tissues, organs, and organ systems and their development from simple structures to more complicated systems will be examined. 3 cr, 3 lec, 2 tut. Credit restriction: BIOL 1010U.

BIOL 2010U Introductory Physiology. Overview of the major physiological processes involved in plant and animal growth and development including the mechanism of action of growth regulators and hormones. Emphasis is placed on the use of genetic, biochemical, and physiological approaches to understand the regulation of different systems in plants and animals. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: BIOL 1020U.

BIOL 2020U Genetics and Molecular Biology. An introduction to the fields of genetics and molecular biology. Topics include the science of inheritance, DNA structure and replication, meiosis, regulation of gene expression, sexlinked inheritance, analysing inheritance and heredity, human genetic disorders, and the molecular biology technology on which DNA cloning, and construction of recombinant DNA and of transgenic organisms is based on. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: BIOL 1020U. Credit restriction: BIOL 2840U.

BIOL 2030U Cell Biology. Provides a basic knowledge of the structural and functional properties of cells. Emphasizes the mechanisms by which signalling molecules and the process of signal transduction integrate and coordinate the functions of many individual cells in a multi-cellular organism. Explores factors regulating the cell cycle and growth. 3 cr, 3 lab (biweekly), 2 tutorial (biweekly). This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and self-learning material. Prerequisite: BIOL 1020U. Credit restriction: BIOL 2840U.

BIOL 2040U Biochemistry. Focuses on enzyme mechanisms and stereochemistry, carbohydrate metabolism, glycolysis, glycogen breakdown and synthesis, transport across membranes, the citric acid cycle, electron transport and oxidative phosphorylation, the pentose phosphate pathway and the glycoxylate pathway, lipid metabolism, synthesis and role of ketone bodies, amino acid metabolism, and an overview of the urea cycle. 3 cr, 3 lec, 2 tut. The tutorial is offered in hybrid format, involving 1 in-class, 1 online tutorial material. Prerequisites: BIOL 1020U, CHEM 2020U. Credit restriction: BIOL 1810U.

BIOL 2050U Human Anatomy. This course is an introduction to the study of body structure with a strong emphasis on human anatomy. Emphasis will be put on the description of bones and joints, muscles, nerves, and blood vessels and lymphatics. The structure of various organs found in the thoracic, abdominal and pelvic cavities will also be described. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite BIOL 2010U.

BIOL 2830U Microbiology for Health Science (formerly BIOL 1820U). Introductory microbiology is a survey study of the comparative biology of micro-organisms, directed toward students in health and biological science programs. Common infectious diseases will be examined using a body systems approach. Online tutorial activities will focus on correct aseptic principles, identification of organisms and diagnostic microbiology. Core concepts will be presented and studied in ways that prepare students to apply their understanding in practice in their specific discipline. 3 cr. This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and self-learning material, and an online tutorial. Prerequisites: HLSC 1200U, HLSC 1201U. Credit restriction: BIOL 1820U, BIOL 3030U.

BIOL 2840U Cell and Molecular Biology. This course covers basic properties of cells, cell organelles, differentiated cell systems and tissues. Students will be introduced to scientific literature on the subject of cell biology in order to become familiar with the experimental evidence that supports current knowledge of the cell. They will also learn how to critically examine data and interpretations presented by researchers. 3 cr, 2 lab (biweekly), 2 tut (biweekly). This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and self-study material. Prerequisite: BIOL 1020U or BIOL 1840U. Credit restrictions: BIOL 2020U, BIOL 2030U.

BIOL 3010U Laboratory Methods in Molecular Biology. Laboratory-based instruction in the basic methodologies used in the construction of recombinant DNA molecules and construction of transgenic organisms. Students will develop technical skills commonly used in the field of molecular biology, practical knowledge sufficient to perform basic procedures independently, and to analyse experimental results obtained with these techniques. 3 cr, 6 lab. Prerequisites: BIOL 2020U, BIOL 2040U, BIOL 3030U.

BIOL 3020U Principles of Pharmacology and Toxicology. An overview of the action and toxicity of drugs that affect the autonomic nerv-

ous system, the central nervous system, and cardiovascular function in both normal and pathological conditions. Toxicological effects of food, food additives, household and industrial products and wastes will also be examined. 3 cr, 3 lec. Prerequisites: BIOL 2010U, BIOL 2040U. Credit restriction: NURS 2810U.

BIOL 3030U Microbiology and Immunology. An introduction to the field of microbiology, with emphasis on the interactions of microbes with host organisms in symbiosis and pathogenesis. The immune response obtained during a host-pathogen interaction will be used to provide an overview of the cells and organs of the immune system, antigen-antibody interactions, immune effector molecules, vaccines and immunodeficiency diseases. 3 cr, 4 lab. This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and self-learning material. Because of the nature of the experiments performed in the lab, students will be required to come to the lab at additional times, scheduled throughout the week, averaging 1 hour per week outside of the regular 3 hour lab session in order to check the progress of experiments. Prerequisites: BIOL 2030U. Credit Restrictions: BIOL 1820U, BIOL 2830U.

BIOL 3040U Physiology of Regulatory Systems. Examines the close relationship between structure and function from the molecular to cellular to organic level and the processes by which regulation of physiological functions occur. Emphasis is placed on the sensing and signalling systems (nervous and endocrine) and then on the effector systems (muscles and glands). 3 cr, 3 lec, 3 lab. Prerequisites: BIOL 2010U, BIOL 2030U, BIOL 2040U.

BIOL 3050U Developmental Biology. Emphasizes principles and key concepts that govern the process of development in vertebrates, with some examples from invertebrate models. Examines how a single fertilized cell gives rise to hundreds of differentiated cells, how differentiated cells are organized into tissues and organs, how the growth of cells is regulated, and how an adult transmits the instructions for making an organism from one generation to the next. 3 cr, 2 lec, 3 lab. Prerequisites: BIOL 2020U, BIOL 2030U.

BIOL 3060U Fundamentals of Neuroscience. Neuroscience is the study of the nervous system and how it operates at the organism level with respect to behaviour, learning and memory. This course provides a broad introduction to neuroscience. The topics covered range from the molecular and cellular mechanisms underlying neural function to an introduction to complex behaviours such as thought and language. 3 cr, 3 lec, 3 lab (biweekly). Prerequisites: PSYC 1000U, BIOL 2040U, BIOL 2050U.

BIOL 3610U Comparative Zoology. Provides a general knowledge of the biology of both invertebrates and vertebrates. Various concepts related to form, function, ecology and evolution will be emphasized and compared in the lecture material. Diversity within each phylum will be examined and adaptive explanations will be sought for how these organisms have adapted to the environment. 3 cr, 3 lec. Prerequisite: BIOL 2010U.

BIOL 3620U Conservation Biology. Designed to help students of biodiversity develop practical skills and knowledge that they can use in their professional and personal lives. Integrates local (Ontario), regional (Canada) and global scales of diversity, both of life and of our human responses to these issues. The first unit explores the diversity of species and the genetic basis for their evolution and adaptation. The tools used to measure biodiversity are introduced and the moral and management issues involved in the protection of biodiversity are addressed. 3 cr, 3 lec, 1 tut. Prerequisite: BIOL 2020U.

BIOL 3630U Soil-Plant Relationships. Explores the interrelationships between soil characteristics, root growth, water and nutrient absorption and the mineral nutrition of plants. Topics to be covered include shootroot relations, root growth, soil-plant atmosphere, water relations, soil aeration and plant growth, nutrient transport in the soil-plant system, the root-soil interface, the function of nutrients in plants, nutrient management for sustainable plant production. 3 cr, 3 lec. Prerequisite: BIOL 2010U.

BIOL 3640U Plant Biology. Provides a working knowledge of the structure of vascular plants. The primary topic areas are the plant cell and its components, apical meristems and development of primary tissue systems, primary tissue organization, secondary growth, and floral structure. Structural fitness of tissues and organs for functions they perform are also examined. 3 cr, 3 lec. Prerequisite: BIOL 2030U.

BIOL 3650U Fundamentals of Nutrition. This course provides the basic concepts for the study of human and animal nutrition. Topics will include those related to macronutrient nutrition, fibre and energy metabolism. The structure and function of macronutrients and fibre, their digestion, absorption and metabolism in the body and their implications for health will be discussed. 3 cr. This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and online self-learning material. Prerequisite: BIOL 2040U. Credit restriction: HLSC 2820U.

BIOL 4010U Introduction to Environmental Research Methods. Introduction to methods of developing, evaluating and using evidence in environmental studies. Methods for summarizing and critical appreciation of data describing environmental systems. Skill development in applying statistical techniques and in using microcomputers as a research tool. 3 cr, 3 lec, 3 tut. Prerequisite: STAT 3010U.

BIOL 4020U Environmental Risk Characterization. A biologically-based course that surveys current risk assessment issues in ecotoxicology. Topics include problem definition, effect and exposure characterization, risk assessment and risk management decision making. 3 cr, 3 lec. Prerequisite: BIOL 3020U.

BIOL 4030U Advanced Topics in Environmental Toxicology. Highlights advanced concepts, techniques, research, and industrial applications in the area of environmental toxicology. Selected topics include nutritional toxicology and food safety, toxicology of drugs, contamination of water resources, toxicity and biological fate of pesticides, herbicides, and other environmental contaminants, molecular toxicology, P-450, genetic toxicology, biomedical toxicology, plant pathology, and toxicological epidemiology. 3 cr, 3 lec. Prerequisite: BIOL 3020U. Note: An independent term project will be part of this course.

BIOL 4040U Applied Molecular Biology. A comprehensive study of the molecular biology-based techniques used in biotechnology, basic research, treatment of disease, food production, and forensic science. Applications of these techniques will be illustrated using recently published original research journal articles. 3 cr, 3 lec. Prerequisite: BIOL 3010U.

BIOL 4050U Advanced Topics in Pharmaceutical Biotechnology. Highlights the fundamental research and industrial applications of pharmaceutical biotechnology in selected areas including psychopharmacology, cardiovascular pharmacology, neuropharmacology, endocrine pharmacology, quantitative pharmaceutical analysis, drug discovery and design, safety and quality assurance, and protein engineering. 3 cr, 3 lec. Prerequisite: BIOL 3020U. Note: An independent term project will be part of this course.

BIOL 4060U Functional Genomic and Proteomics. An overview of genomics (the study of the structure and function of complete sets of genes of a genome) and proteomics (the study of the structure and function of the complete set of proteins that the genome expresses). The complexity of genes, genome organization, protein structure and methods used for analysis will be discussed from both an historical and current perspective. The practical use of software tools for analysis of genomic and proteomic data will be introduced. 3 cr, 3 lec. Prerequisites: BIOL 3010U, BIOL 4070U.

BIOL 4070U Advanced Biochemistry. A systems-oriented course in which biochemical structure, function and metabolism are presented in an integrated fashion. Topics will include protein structure, enzyme regulation, regulation and integration of metabolism, and mechanisms by which a cell's metabolism responds to the environment. 3 cr, 3 lec. Prerequisite: BIOL 2040U.

BIOL 4080U Bioethics. Introduction to bioethical methods and theory to guide discussion of bioethical issues related to the various disciplines in biology including the environment and moral relationships between humans and the rest of the world. Students will discuss bioethical issues from a historical, sociological, and philosophical perspective, with a consideration of how religious beliefs, political ideology, and the law influence positions. 3 cr, 3 lec. Prerequisite: Registration in year four of a biological science program.

BIOL 4410U Biology Thesis Project I. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study and to satisfy specific objectives and requirements. The project will be selected to include research that has

been approved by the supervising faculty member. Students will submit a progress report at the end the first semester. Once all work is completed, each student must submit a thesis and make a presentation based on their research in the following semester. 3 cr, 9 oth. Prerequisite: Students will have completed 90 credit hours in their area of specialization and be in clear standing, and must obtain prior consent of a faculty member. Note: Students are expected to take BIOL 4420U in the following semester.

BIOL 4420U Biology Thesis Project II. A continuation of the project started in BIOL 4410U. Students will make presentations based on their research and submit a written thesis. 3 cr, 9 oth. Prerequisite BIOL 4410U. Note: students are expected to take this course immediately after BIOL 4410U.

BIOL 4430U Directed Studies in Biology. This course requires independent research of a current topic in a specialized area of biology, including, but not restricted to, ecology, physiology, genetics, microbiology, and molecular biology. The topic will be selected from the recent research literature and involve a review and critical appraisal of underlying experimental principles. The course comprises independent library research, participation in weekly meetings, and written and oral presentations. 3 cr, 1 lec, 2 oth. Prerequisite: Students will have completed 90 credits in their area of specialization. Note: Students are expected to take this course in one semester and a science elective as specified in the program map to complete the honours requirement.

BIOL 4610U Field Biology. Each year the Ontario Universities' Program in Field Biology offers a diversity of field courses in habitats ranging from the Arctic to the Tropics, microbes to mammals, and covering marine, freshwater and terrestrial habitats. A complete list of the field courses offered is available is available at **http://bioserv2.mcmaster.ca/oupfb/index.htm/**. The website includes the course list, the faculty coordinator and the host university. Only courses equivalent in weight to 3 credit hours (one half-course) at UOIT may be applied to the requirements of the BSc degree. 3 cr. Prerequisites: As specified by host university.

BIOL 4620U Animal Behaviour. This course is designed to provide students with the theoretical background necessary for an understanding of animal behaviour. Students will learn to observe and characterize the behaviours. Key factors such as genetics, developmental and environmental affects will be studied. 3 cr, 3 lec. Prerequisite: BIOL 3610U.

BIOL 4630U Plant Physiology. Provides a greater understanding of the mechanisms and experimental data introduced in the introductory physiology course. Topics include the processes involved in plant growth and development. Emphasizes basic mechanisms of plant development and function, current research in the field, and the use of genetic, biochemical, and physiological approaches to understand the regulation of plant growth. 3 cr, 3 lec. Prerequisites: BIOL 2010U, BIOL 3640U.

BUSI 1101U Financial Accounting. This introductory course examines financial accounting theories, principles, techniques and practices in a Canadian context. Students are introduced to the role of accounting in the business environment, measuring income, valuing assets and liabilities, generally accepted accounting principles, partnership and corporate accounting. 3 cr, 3 lec.

BUSI 1450U Statistics. This course introduces the fundamental concepts and applications of descriptive and inferential statistics and probability theory. It also introduces statistical model building. Emphasis is balanced among theoretical concepts, calculations (including computer-based calculations), and data interpretation. 3 cr, 3 lec. Credit restrictions: STAT 2010U, STAT 2020U, STAT 2800U, HLSC 3800U, SSCI 2910U.

BUSI 1500U Business Communications and Computing Skills. This experiential course develops students' proficiency at communicating via interpersonal (one-on-one and small group), electronic and written means and develops computing application skills. Topics include: components of effective business communication (audience, content and delivery); interpersonal skills and the art of effective persuasion; computer literacy and electronic forms of communication; computing applications; the toolbox of effective business writing vocabulary, spelling, grammar, style, punctuation, organization; business writing, planning, researching, reading/thinking, outlining, organizing, writing, rewriting, citing sources, editing, presenting, memos and reports, and special situations job search and interviews. 3 cr, 3 lec.

BUSI 1520U Business Computer Applications. This course helps students use computer applications to aid a variety of business communication and managerial tasks. Tasks include: communication with stakeholders (stockholders, consumers, employees, directors and officers, etc.), government, and the media; preparation of advertising; communication for project management; decision-making tools; and user-oriented security. 3 cr, 3 lec. Note: This course is not available to computer science students for credit.

BUSI 1600U Management of the Enterprise. This introductory management course is divided into four parts. Students will be introduced to the core concepts and context of management, enhancing their understanding of how the business environment affects the practice of management. The functions of management will be reviewed, including key topics, issues and problems within the basic management activities of marketing, organizational behaviour/human resources, operations management and information technology, accounting, and finance. The latter components will synthesize the ideas presented in earlier classes by introducing fundamental elements of business strategy, followed by advanced topics in management, including small business, entrepreneurship and E-business. 3 cr, 3 lec.

BUSI 1650U External Environment of Management. This course provides an introduction to the national and international context of Canadian political, economic, legal and business activity. It presents a sampling of the most relevant issues facing managers in business, labour and public sector organizations. Emphasis is placed on developing an understanding of Canada's competitive position today and of the historical background and current influences on this position. Topics covered include an overview of the historical and contemporary socio-economic events that shape the Canadian and global economies today, the changing world scene, the attractiveness of various world markets, the relative position of Canada vs. the world with respect to labour, capital, and technology, different measures of competitiveness, as well as policy recommendations. 3 cr, 3 lec. Prerequisite: BUSI 1600U.

BUSI 1700U Introduction to Entrepreneurship. Introduces entrepreneurship as a discipline and covers all facets of entrepreneurship, including economics, society, intrapraprepreneuring, and issues, including starting and managing a successful new business venture; new venture capital, creation, and management. 3 cr, 3 lec.

BUSI 1830U Introduction to Programming. This course introduces students to general computer programming principles. Topics include basic computer hardware and software concepts, problem analysis, design of algorithms and programs, the selection of data types, basic I/O, repetition and flow control, decision making, and optionally, principles of object-oriented languages. The course uses a programming language such as Java or C. Applications to business, science and engineering are illustrated.3 cr, 3 lec. Cross-listed: ENGR 1200U. Not open to BIT students.

BUSI 1900U Mathematical Foundations for Business. This course provides a core mathematical background for students who are undertaking their BCom. Two main areas of coverage are calculus and linear programming. Theoretical concepts are balanced with hands-on calculations and an emphasis on problem solving. Students will also use graphing software and other computer tools to explore graphs of functions, to analyse the basic characteristics and properties of functions, and to become more successful in mathematical problem solving with the use of technology. 3 cr, 3 lec. Not open to students who received credits in MATH 1010U or MATH 1850U.

BUSI 2000U Collaborative Leadership. This course intends to develop critical employability skills such as teamwork, leadership, project management, communication skills and intercultural understanding, and will focus students' learning on topics related to interactions with others in personal, educational and professional contexts. Students will engage in collaborative and dynamic learning activities involving direct and practical application of the content/skills critical to professional success. They will explore the practice and impact of leadership, negotiations and teamwork in organizations and communities. These practices will be examined in a variety of settings as described in both popular and academic writings. Learning activities will be directed toward developing leadership for

exceptional performance, obtaining commitment to goals and standards, negotiating and resolving conflict, inter-cultural communications, ethical practice, and relating with others in team environments.3 cr, 3 lec.

BUSI 2050U Economics for Professionals. Aspects of theoretical and applied economics relevant to professionals. Fundamental principles in both micro- and macro-economics are introduced. Microeconomics topics include scarcity, opportunity cost, diminishing returns, elasticity, industrial organization, economies of scale and concentration. Macroeconomics topics include unemployment, inflation, economic growth, the multiplier, equilibrium, fiscal policy and monetary policy. The principle of money and banking are introduced along with the role of the Bank of Canada. Applied economics topics covered include cost concepts, time value of money, comparison of alternatives, depreciation, tax considerations, economic analysis of projects, break-even, sensitivity and risk, and decision models. 3 cr, 3 lec.

BUSI 2120U Accounting for IT. Accounting for IT will develop an understanding of how to use, interpret, and understand financial statements and other accounting information. The course will emphasize the role of judgment in accounting and how the managers responsible for preparing accounting information have considerable latitude in deciding how and what information to report. The course uses financial statements and other examples from IT firms to develop an understanding of financial accounting from an IT perspective. 3 cr, 3 lec. Open to BIT students only.

BUSI 2150U Financial Accounting I. Financial accounting is concerned with producing information about an economic entity and communicating that information to people who are external to the entity that want or need the information for making decisions. This course is designed to provide an understanding of the accounting process and the choices that exist so that students can be informed and skilled users of accounting information. The course focuses on uses of accounting information for different decisions and from different stakeholder perspectives, and considers the economic and behavioural effects that accounting treatments have on users and preparers. There is an emphasis on interpreting, analysing, and understanding information. Readings from current publications are used to integrate practical applications of the issues discussed in class. This course is not designed to develop accountants, but it is appropriate for accounting majors. Classroom techniques that develop students' critical skills will be used. 3 cr, 3 lec.

BUSI 2160U Financial Accounting II. This course is a continuation of BUSI 2150U. It will build on the concepts and skills developed in BUSI 2150U. Readings from current publications are used to integrate practical applications of the issues discussed in class. Case studies, classroom discussions, student presentations and research projects are used to enhance students' critical thinking skills. This course is not designed to develop accountants, but it is appropriate for accounting majors. 3 cr, 3 lec. Prerequisite: BUSI 2150U.

BUSI 2170U Managerial Accounting. This course is an introduction to managerial accounting concepts with a focus on decision making. The course is case oriented and stresses both a manager's and an accountant's perspective on accounting information. Application of techniques is stressed. Students will learn to evaluate techniques based on their implicit assumptions, costs and benefits and appropriateness for specific decisions. Application of concepts and development of critical thinking skills are crucial aspects of this course. 3 cr, 3 lec. Prerequisite: BUSI 2160U. Corequisite: BUSI 1101U.

BUSI 2201U Marketing I. This introductory course addresses the basic concepts and practices of modern marketing. It will provide a firm understanding of how to define and segment a market; how to develop products and services for chosen target markets; how to price offerings to make them attractive and affordable; how to choose intermediaries to make products available to customers; and how to develop a promotional mix in order that customers will know about and want a firm's products. For students, it provides a broad range of marketing skills in order to determine, serve and satisfy the needs and wants of a customer. 3 cr, 3 lec. Prerequisite: BUSI 1650U or BUSI 2000U.

BUSI 2202U Marketing II. This course builds upon the basic concepts and practices of modern marketing introduced in Marketing I.

It will provide a firm understanding of how to define and segment a market; how to develop products and services for chosen target markets; how to price offerings to make them attractive and affordable; how to choose intermediaries to make products available to customers; and how to develop a promotional mix in order that customers will know about and want a firm's products. For students, it provides a broad range of marketing skills in order to determine, serve and to satisfy the needs and wants of a customer. 3 cr, 3 lec. Prerequisite: BUSI 2201U.

BUSI 2205U Marketing in the Information Technology Sector. This course is concerned with the development of marketing techniques and strategies for the IT sector. Special emphasis is placed on the evolving business and technological environments facing IT firms. Topics include positioning, distribution, branding, and pricing strategies for IT companies. Note: Designed for non-BCom students. Not available for credit toward the Bachelor of Commerce Degree. Students who have received credit for BUSI 2201U cannot take this course for credit. 3 cr, 3 lec.

BUSI 2311U Organizational Behaviour. This course provides students with a basic understanding of the fundamentals of organizational behaviour. The concepts of individual perceptions and attitudes, group dynamics, motivation, communication, leadership, and power are studied, as well as aspects of the organizational system such as organizational culture and change. Application to human resources management will be highlighted throughout the course. Using interactive techniques and case studies, students will have opportunities to apply organizational behaviour theories, concepts, and practices. 3 cr, 3 lec. Prerequisite: BUSI 2000U.

BUSI 2312U Introduction to Human Resources Management. This course provides students with a basic understanding of the fundamentals of human resources management. The focus of this course is on the management aspect of human resources in order to create an environment that is conducive to maximum productivity. Students will be introduced to effective strategies for attracting, retaining and motivating staff; demographic challenges; human resources planning; performance management; and managing diversity. The impact of technology and human resources information systems will be highlighted throughout the course. Using interactive techniques and case studies, students will have opportunities to apply human resources management theories, concepts, and practices. 3 cr, 3 lec. Prerequisite: BUSI 2311U.

BUSI 2340U Organizational Issues: Problems and Directions. The focus of this course is on the procedures and variables involved in the design and redesign of organizations. Students will be introduced to issues such as departmentalization, differentiation, integration, internal politics, innovation, authority and control, focusing on the underlying technology of the organization. Emphasis will be placed on how one designs both the technical and the organizational systems to ensure their compatibility, noting the effects that one has on the other. Using interactive techniques and case studies, students will have opportunities to apply theories, concepts, and practices. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 2401U Finance I. This course is an introduction to basic concepts in corporate finance. The course develops tools and concepts for understanding of problems facing financial managers. Topics include time value of money, financial ratios, stock and bond valuations, capital investment decisions and short-term finance. 3 cr, 3 lec. Prerequisite: BUSI 1101U or BUSI 2150U.

BUSI 2402U Finance II. This course provides an advanced understanding of corporate finance with focus on financial markets. Topics covered in this course include financial securities and financial markets, understanding and measurement of risk and returns, cost of capital, financial leverage of the firm and its dividend policy. The course will also introduce students to international corporate finance and to the practice of mergers and acquisitions. 3 cr, 3 lec. Prerequisite: BUSI 2401U.

BUSI 2501U E-Business Technologies. This course introduces the fundamental concepts and applications of e-business technologies from a managerial perspective. Electronic business (e-business) is the use of electronic communication networks (e.g., Internet) to conduct any form of economic activity between trading partners. E-business encompasses an organization's internal operations

and business processes. This course covers the topics of impacts of e-business, barriers to e-business, the Internet and World Wide Web (WWW) for e-business, e-business applications development, information technologies for e-business, privacy and security in e-business, electronic payment systems, and e-business architecture.3 cr, 3 lec. Prerequisite: BUSI 1830U or INFR 1100U.

BUSI 2502U E-Commerce. This course deals with the development of Internet and its impacts on business transactions. The course explains how electronic commerce affects the way companies, governments, and people conduct business. Topics include the role of Internet, electronic marketplace, privacy and security issues, and electronic payments. 3 cr, 3 lec. Prerequisite: BUSI 1830U or INFR 1100U.

BUSI 2504U E-Learning. This course introduces the concept of online learning and multimedia technology in the development of interactive multimedia-based learning systems and computer-based training (CBT) courseware. This course covers e-learning development methodologies, including best practices in e-learning design and development, assessment in human factors; and introduces CBT/WBT design process, online testing, and course management program administration. 3 cr, 3 lec. Prerequisite: BUSI 1830U or INFR 1100U.

BUSI 2505U E-Recruitment and Human Resource Information Systems. The focus of this course is on the procedures and variables involved in the design and implementation of human resources management information systems. Students will be introduced to issues such as planning HR systems, software evaluation, the human aspect of technology, as well as how to create a business case for the implementation of technology. Key trends such as outsourcing, telecommuting, and web-based HR in an international setting will also be examined. Using interactive techniques and case studies, students will have opportunities to apply theories, concepts and practices. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 2603U Introduction to Operations Management. This course introduces students to the functional area of production and operations management as practiced in manufacturing industries and the services sector. It includes decision-making, project management, facility layout in both manufacturing and service industries, waiting lines, quality control, just-in-time systems, forecasting, aggregate planning, inventory management, materials requirements planning and operations scheduling. 3 cr, 3 lec. Prerequisite: BUSI 1450U or STAT 2800U.

BUSI 2604U Introduction to Project Management and Supply Chain Management. This second level course continues to study the functional area of production and operations management as practiced in manufacturing industries and the services sector. It includes decision-making, project management, facility layout in both manufacturing and services industries, waiting lines, quality control, just-in-time systems, forecasting, aggregate planning, inventory management, materials requirements planning and operations scheduling. 3 cr, 3 lec. Prerequisite: BUSI 2603U.

BUSI 2610U Quality Frameworks. In this theory and lab-based course, students examine the planning tools and techniques used to establish a quality focused system. As well, students look at the effective monitoring and continual improvement in the quality of an organization's products and services. Other topics include quality planning, process capability, gauge capability, Pareto analysis, quality costs, cause and effect, regression-correlation, ANOVA, ISO 9000 and acceptance sampling. 3 cr, 3 lec.

BUSI 2620U Business Ethics. This course seeks to answer some fundamental questions, including: Why do organizations need to address ethical issues? What ethical issues arise in the course of business activity? How can individuals and organizations address questions of morality in business? What are the ethical obligations of business people and organizations in society? How do organizations manage for ethical practice and social responsibility? What can individuals do to encourage ethical business practice? The following topics are examined in the course: business ethics and strategic management; stakeholder impact analysis and ethical decision-making; employees as stakeholders; customers and suppliers as stakeholders; the environment and local communities as stakeholders, the legal environment of corporations and the professions; compliance programs; crisis management and global business ethics. 3 cr, 3 lec.

BUSI 2650U Supply Chain and Vendor Management. This introductory course in supply chain management covers the following topics: supply chain activities and functions, the role of purchasing in the supply chain, the purchasing process, purchasing and information technology, sourcing strategies, electronic marketplaces and e-procurement, negotiating techniques, quality considerations in purchasing, outsourcing and supplier price determination. 3 cr, 3 lec. Prerequisite: BUSI 2604U.

BUSI 2700U Entrepreneurial Finance. This course examines how individual entrepreneurs, companies and capital providers manage the entrepreneurial process and its financial aspects. The course analyses a wide range of business models and suggests a wide range of solutions to overcome financing and valuation challenges. The course does not only focus on valuation and the analysis of financial challenges that arise over the life cycle of the entrepreneurial venture, but also focuses on the analysis of the people and business models of entrepreneurial ventures.3 cr, 3 lec. Prerequisite: BUSI 1700U.

BUSI 2705U Legal Environment of Business. This introductory business law course covers the following subjects: the Canadian legal system, the US legal system (including class actions, contingency fees, jury trials, punitive damages, cost structures etc.), the legal profession, constitutional law, legal research, contract law (including offer, acceptance, consideration, legality, capacity, misrepresentation, breach, remedy etc.), business associations (sole proprietorships, partnerships and corporations), corporation law, officer and director liability, commercial transactions, civil litigation, alternative dispute resolution, employment law, negligence, professional liability, tort law, real estate law, consumer protection, competition law, marketing law, environmental law, intellectual property law, Internet law, comparative laws and damages and remedies. 3 cr, 3 lec.

BUSI 2930U Leadership, Negotiation and Teamwork. This course examines the practice and impact of leadership, negotiations and teamwork in organizations and communities. These practices will be examined in a variety of settings as described in both popular and academic writings on the subjects. It is organized around sets of activities critical to managerial success, each involving face-to-face interaction and a high degree of interpersonal skill: developing leadership for exceptional performance; obtaining commitment to goals and standards; negotiating and resolving conflict; cultural awareness; and relating well with one another in team environments. Implications for personal and career development will also be incorporated. Other topics covered include current thinking and research on negotiating, international negotiations and the effect of culture on negotiating styles. 3 cr, 3 lec.

BUSI 3040U Information Systems. This course introduces students to the management issues, concepts and terminology associated with information technology systems. This course is of interest to students with either a technical or a non-technical background. Issues discussed include: the role of computers in modern organizations; data models and their relation to organization models; systems development processes; and systems theory. Students will learn to recognize opportunities for use of computer-based technology at strategic, tactical and operational levels; the technical and organizational problems generated by introducing new technology; and the long-term organizational implications of these decisions. 3 cr, 1.5 lec, 1.5 tut. Prerequisite: Year three standing in BCom, or year three standing in the HIM program.

BUSI 3101U Intermediate Financial Accounting I. This course provides an in-depth examination of the accounting concepts, principles, practices, objectives, and techniques underlying asset valuation and income determination. Special emphasis is placed on accounting policy choices and the criteria by which such choices are made. The course makes extensive use of cases to develop an understanding how and why managers make accounting policy choices and the impact of those choices on financial statement users. Critical thinking and problem solving skills are developed. 3 cr, 3 lec, 2 tut. Prerequisite: BUSI 2160U.

BUSI 3102U Intermediate Financial Accounting II. This course focuses on the valuation and presentation of liabilities and owners' equity. Topic coverage includes current, long-term and contingent liabilities; leases; pensions; future income taxes; capital transactions; earnings

per share, and analysis of financial statements under alternative accounting policies. The perspectives of both preparers and users of accounting information are considered in the coverage of these topics. 3 cr, 3 lec, 2 tut. Prerequisite: BUSI 3101U.

BUSI 3110U Introduction to Taxation. The basic concepts and techniques of income taxation and applications to personal tax are examined. 3 cr, 3 lec, 3 tut. Prerequisite: BUSI 2160U.

BUSI 3120U Advanced Taxation. The basic concepts and techniques of income taxation and applications to corporate tax are examined. 3 cr, 3 lec, 2 tut. Prerequisite: BUSI 3110U.

BUSI 3150U Financial Statement Analysis. The purpose of this course is to develop knowledge and experience in using and interpreting financial statement data to make informed decisions as external financial statement users. In the course a general approach to examining financial statements will be developed and this approach will be applied four common financial statement uses: evaluating the performance of managers; evaluating risk including the likelihood of financial distress; forecasting financial statement figures; equity valuation using various valuation techniques and assumptions. 3 cr, 3 lec. Prerequisite: BUSI 2160U.

BUSI 3160U Advanced Managerial Accounting. This advanced level course develops problem solving skills for internal accounting applications. Topics include: cost concepts and analysis; cost accumulation for product costing and variance analysis; cost analysis for decisions involving alternatives; advanced manufacturing technology and accounting concerns are addressed including activity-based costing; target costing; international approaches to cost management; quality costing; benchmarking; life cycle costing; the balanced scorecard and new performance measures; business strategy and competitive positioning; the value chain and competitor analysis; generic strategies and control systems design; management accounting and e-commerce. Cases and problems are used. A research project is required for this course. 3 cr, 3 lec. Prerequisite: BUSI 2170U.

BUSI 3165U Management Control Systems. This course focuses on the theory and practice of the design and administration of management planning and control systems. The point of view emphasized is management and organization theory. Theory and research literature are reviewed. Cases of actual company systems are used. A research project may be required. 3 cr, 3 lec. Prerequisite: BUSI 2170U.

BUSI 3170U Auditing Standards and Applications. This course focuses on the standards, theory and applications underlying the functions and responsibilities of external and internal auditors. The theory of audit evidence and basic techniques are used to provide an understanding of auditing methodology and procedures. The auditor's responsibility beyond the financial audit and current developments in auditing are also examined. Review engagements are also examined. Students are expected to complete and present a research paper or project. 3 cr, 3 lec. Prerequisite: BUSI 2160U.

BUSI 3171U Advanced Auditing. This course extends students' knowledge of auditing by examining the role of the profession in society, evaluating current concerns and issues facing auditors, and building on the understanding of the general audit frame work and its essential theories. This course also examines specific audit topics such as comprehensive auditing, audit of not-for-profit entities, environmental auditing and small business audits. Students generally are expected to complete and present a research paper or project. 3 cr, 3 lec. Prerequisites: BUSI 3101U, BUSI 3102U, BUSI 3170U.

BUSI 3172U Auditing Information Systems. This course is designed to introduce and enhance the students' knowledge about the topic of auditing in computerized environments. The course will focus on issues such as information system concepts, audit and control risks, and implementation and evaluation of security and controls. 3 cr, 3 lec. Prerequisite: BUSI 3170U.

BUSI 3200U Marketing Communications. This course is a study of communication functions in marketing. Students will study the communication methods such as advertising, promotion, personal selling, public relations, and direct marketing in order to achieve a company's marketing objectives. Topics include communication strategies, sales promotion, budgeting, and selection of communication channels. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 3210U Consumer Behaviour. This course focuses on the concepts and theories of consumer behaviour. It examines the impacts of psychological, sociological and other factors on individual and group decision-making processes. Topics include perceptions, values, choices, learning, memory, attitudes, and purchase decisions. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 3220U Sales Management. This course examines the role of sales and sales management as an overall marketing strategy. Topics include recruitment, selection, training, monitoring, motivation, compensation, and supervision of the sales force; forecasting and measurement of sales performance; and the coordination of sales activities with advertising and other activities of the organization. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 3250U Service Marketing. This course analyses the differences between marketing tangible products and marketing services. The focus is on service issues such as customer satisfaction, marketing mix variables, and the importance of service measurement and quality. Specific service industries such as health care and consulting will be studied. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 3260U Marketing Research. This course is concerned with research methods used in marketing. The course focuses on contemporary research techniques and analysis of market-related data. Topics include research design, data collection, data analysis, interpretation, and reporting. 3 cr, 3 lec. Prerequisites: BUSI 1450U, BUSI 2202U.

BUSI 3280U Brand Management. This course examines the creation and management of brand equity in modern business enterprises. Special emphasis is placed on the importance of brand equity, brand extensions, brand valuation and global branding. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 3305U Recruiting and Selection. The focus of this course is on the procedures and variables involved in the recruitment and selection of employees. Students will be introduced to issues such as recruiting methods for locating and attracting different types of applicants, identifying and analysing the effectiveness of the key steps in the selection process, evaluating the reliability and validity of various selection techniques and testing methods. Key trends such as outsourcing, video conferencing, and web-based recruiting and selection tools will also be examined. Using interactive techniques and case studies, students will have opportunities to apply theories, concepts, and practices. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3312U Industrial and Labour Relations. The focus of this course is on the procedures and variables involved in collective bargaining and union/management relations. Students will be introduced to issues such as union development, the effect of unions on organizational behaviours, the collective bargaining process, the grievance and arbitration process, and other aspects of collective agreement administration. Emphasis will be placed on private sector labour relations. The use of case analysis and role playing will allow students to apply theories from the course and demonstrate the arbitration process. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3315U Negotiation Theory and Behaviour. The focus of this course is on the procedures and variables involved in the various models of negotiation. Students will be introduced to issues such as the strategies and tactics of negotiation, negotiation ethics, principles of positional, interest-based, intra-organizational, and principled bargaining in a variety of organizational contexts. Emphasis will be placed on negotiations as behavioural and decision-making processes. The use of case analysis and role playing will allow students to apply theories from the course and demonstrate the negotiation process. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3319U Conciliation and Dispute Resolution. The focus of this course is on the procedures and variables involved in conflict management and dispute resolution. Students will be introduced to issues such as the cause and consequences of conflict in organizations, and dispute resolution in international commerce. Emphasis will be placed on dispute resolution under NAFTA and WTO. Various theories of negotiation will be introduced at the beginning of the course as an initial starting point of dispute resolution discussion. The use of case analysis and will allow students to apply theories from the course and demonstrate the dispute resolution process. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3330U The Management of Change. As the environment of many organizations (both for profit and non-profit) becomes increasingly complex and unstable, it is crucial that top managers be able to create a climate of adaptability in their organizational practices. Students will examine issues such as the relatedness of internal and external environments, structure, technology, size and function of organizations. Emphasis will be placed on interdependencies of the components of an organization during planned change. The use of case analysis will allow students to apply theories from the course and demonstrate how to overcome obstacles during the change process. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3340U Human Resource Planning. This focus of this course is on the strategies involved in planning for the human resource needs of an organization. Students will examine issues such as the assessment of current human resource assets, planning for future requirements, personnel selection, and rights/equal employment legislation. Emphasis will be placed on recruitment and selection strategies and how they can be used as a competitive advantage for the organization. The use of case analysis will allow students to apply theories from the course and demonstrate a comprehensive human resource planning strategy. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3350U Developing Management Skills. This focus of this course is on the skills managers need to effectively run an operation within an organization. Students will examine issues such as stress and time management, leadership, motivation, conflict management, and negotiation skills. Emphasis will be placed on the application of the skills in workplace situations. The use of case analysis, presentations, and experiential activities will allow students to apply theories from the course and demonstrate the skills they have acquired. Due to the high amount of time spent on experiential exercises, absenteeism is not permitted. A high percentage of the grade is based on participation in class. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3360U Health and Safety (formerly Quality of Organizational Life). The focus of this course is on the strategies involved in managing employee health and safety in the turbulent environment of today's modern organizations. Students will examine issues such as the demands of new technology, changing individual lifestyles, changing ethnic and gender composition of the workforce, as well as legal, technical, and management issues regarding employee health and safety. Emphasis will be placed on the impact of new technology on work processes, and innovative workplace health and safety programs. The use of case analysis will allow students to apply theories from the course. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3370U Employment and Labour Laws. The focus of this course is on federal and provincial labour laws. Students will examine issues such as the practices of federal and provincial relations boards, the practices of the ministries of labour, affirmative action and the common law of employer-employee relationships. The use of case analysis will allow students to apply theories from the course and demonstrate a understanding of the application of labour laws and employee rights. 3 cr, 3 lec. Prerequisite: BUSI 2705U.

BUSI 3380U Compensation and Benefits. The focus of this course is on the strategies involved in planning for the compensation and benefits needs of employees. Students will examine issues such as key legislation, the fit between compensation and organizational strategies, and how to assess benefit needs of an organization. Emphasis will be placed on creating a total compensation and benefit package that can be used as a competitive advantage for the organization. The use of case analysis will allow students to apply theories from the course and demonstrate comprehensive compensation and benefits knowledge and administration practices. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3390U Training and Development. The focus of this course is on the procedures and variables involved in the design and implementation of training and development programs. Students will be introduced to issues such as how training and development fits within the larger organizational context as well as the assessment of training needs, the development and implementation of the training program, and the evaluation of the effectiveness of existing training programs. Emphasis will be placed on training methods used in employee orientation, skill training

and management development in the context of adult education. The use of case analysis will allow students to apply theories and concepts from the course. 3 cr, 3 lec. Prerequisite: BUSI 2312U.

BUSI 3405U Investments. The course would begin with an overview of the structure of financial markets in Canada followed by a more in-depth analysis of key investment topics. Those topics could include asset allocation and portfolio management, assessment of portfolio performance, the capital asset pricing model, term structure of interest rates, valuation of stocks and bonds, and capital market efficiency. The topics would benefit students wishing to move on in banking or investments, as well as being of interest to those wanting to learn more about how the markets work, or those with personal portfolios. 3 cr, 3 lec. Prerequisites: BUSI 1450U, BUSI 2402U.

BUSI 3410U Financial Institutions. This is an introductory course on financial institutions. The primary objectives of this course is to help students have a better understanding on the key roles of different financial participants, namely the private households, chartered banks, and the central bank. Both theoretical models and real-word examples will be covered to examine the interactions between financial participants which affect the term structures of interest rates, inflation rates, and the economy. 3 cr, 3 lec. Prerequisites: ECON 2020U, BUSI 2402U.

BUSI 3420U Derivative Securities. This course studies the valuation of put and call options, real options, futures and swaps. A number of complex option strategies using derivate securities are analyzed for their ability to speculate or hedge based on capital and money market forecasts. 3 cr, 3 lec. Prerequisites: BUSI 1900U, BUSI 2402U.

BUSI 3450U Business Forecasting Techniques. This course examines the theory and the application of major forecasting techniques and methods used in marketing, economics, operations management, and other functional areas of business. Simple and multiple regression models are studied, followed by time series methods of smoothing, seasonal decomposition, econometrics, and Box-Jenkins ARIMA modeling. After introducing simulation methods and forecasting expert systems, the course addresses important issues of model validation, selection, and control in a business context. 3 cr, 3 lec. Prerequisites: BUSI 1450U, BUSI 1900U.

BUSI 3480U International Finance. This course focuses on an understanding of the determination of exchange rates in the spot, forward, futures and swap markets. Financing and investment vehicles available to corporations as well as how firms manage risks and take advantage of opportunities are emphasized. 3 cr, 3 lec. Prerequisite: ECON 2020U.

BUSI 3503U E-Marketing. This course analyses the use of the Internet for marketing. The implications of electronic commerce for product differentiation, pricing, advertising, branding, and distribution of goods and services will be studied. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 3510U Internet Engineering. This course introduces the fundamental concepts and applications of Internet engineering from a technical perspective. The Internet is a loosely-organized international collaboration of autonomous, interconnected networks, supporting host-to-host communication through standardized protocols and procedures. Internet engineering encompasses the Internet architecture and the application layer protocol and language. This course covers the topics of client-server and peer-to-peer architectures, the eXtensible Markup Language (XML) and a portfolio of related standards (e.g., DTD, XPath, XSL, XSLT, and XPointer), services computing such as Web services and Grid computing, and IP telephony systems (e.g., VoIP and IP Phone). 3 cr, 3 lec. Prerequisites: BUSI 1830U, BUSI 3040U.

BUSI 3520U Applied Internet Multimedia. This course is designed to provide students with an understanding in multimedia technologies and their applications to the development of multimedia products for the Internet. This course will also introduce the tools and procedures required for digital sound recording and editing, analog and digital multimedia presentation (e.g., sound mixers, DAT, videoconferencing equipment), software for developing presentation-based multimedia (e.g., PowerPoint), digital graphics, sound and interactive multimedia, and audio/video streaming technologies. 3 cr, 3 lec. Prerequisites: BUSI 1830U, BUSI 3040U.

BUSI 3530U HTML and Website Design and Management. This course introduces HTML programming and other web design tools. It

also covers the basics of installation, configuration, and administration of web servers, including firewalls and proxy servers. Techniques on website management, collection and analysis of web server statistics, website enhancement, and content management will be discussed. 3 cr, 3 lec. Prerequisites: BUSI 1830U, BUSI 3040U.

BUSI 3540U Object Oriented Programming. This course presents the basic concepts of object-oriented programming and introduces the principles underlying its practice. It also discusses the analysis, design and implementation of an object-oriented system. 3 cr, 3 lec, 3 lab. Prerequisite: BUSI 1830U or INFR 1100U. Cross-listed: INFR 2140U.

BUSI 3550U Information Technology Applications. This course is designed to enable students to use the many tools and techniques used in systems analysis and design, and examines alternative approaches to systems development. These approaches include structured analysis and design concepts, the prototyping of user interfaces, entity-relationship diagrams, data flow diagrams and structure charts. Students will be expected to attain sufficient mastery of these concepts to apply them to a case study. Students will also use a variety of automated computer assisted software engineering (CASE) tools. 3 cr, 3 lec. Prerequisite: BUSI 1830U.

BUSI 3570U Server and Network Administration. This course examines the roles of the server-client computing environment from a design and planning perspective. Topics in this course will include learning the design of a functional infrastructure by identifying organizational settings; and selecting and applying various types of servers including messaging, database, multimedia and web services. Issues on system migration, updates, performance statistics, and security will be covered. Evaluation and selection of server hardware and software systems and their optimization will also be discussed. 3 cr, 3 lec. Prerequisites: BUSI 1830U, BUSI 3040U.

BUSI 3580U WWW Networking. An introduction to the Internet networking technology covering internetworking principles and standards such as OIS model, IEEE standards, and protocols. Networking software, internetworking and interoperability of operating systems will be discussed. Implementation and administration of internetworking services and web servers as well as monitoring, controlling and optimizing networking traffic will be covered. 3 cr, 3 lec. Prerequisites: BUSI 1830U, BUSI 3040U.

BUSI 3600U Inventory Management. This course covers strategic role of inventory management, key strategic drivers of uncertainty in the supply and demand of products, and the tools and techniques for inventory analysis. The course emphasizes inventory control methods with both deterministic and stochastic demand. Other topics included in the course reflect the demands of the manufacturing sector such as machine scheduling, material requirements planning, and multi-echelon production and distribution systems. 3 cr, 3 lec. Prerequisites: BUSI 2604U, BUSI 1450U.

BUSI 3620U Emergent Technologies in Supplier Management. This course covers the emerging technologies used in supply chain management and discusses the role of technology and technological change in creating challenges and new opportunities for companies working to meet the demands of supply chain relationships. It presents the impact of technology on supply chain operations and the development of products and services. The course examines the current practices and future technological directions in supply-chain management and business strategy, and provides innovative new ideas about integrating new technologies into operations, technology-based product and service development, and knowledge management and supply-chain integration issues. 3 cr, 3 lec. Prerequisite: BUSI 2604U.

BUSI 3630U Logistics in the Supply Chain. Logistics is the area of the supply chain that deals directly with customers and customer satisfaction. This course covers issues which are critical to supply chain performance as perceived by the customer, including finished goods inventory planning, transportation industry cost and performance structure, and other third party logistics services, especially warehousing, information technology, and integrated logistics services. Order Fulfillment Process and the Role of Internal Supply Chain Functions; Measurement Issues and Practices in the Supply Chain; Transportation Cost Drivers and Structure of the Transportation Industry; Other Cost Drivers Within the Supply Chain (such as

warehousing); Planning the Logistics Network Using Operations Research Tools; Operations Issues for Logistics with an Emphasis on Logistics Procedures and Legalities; Third Party Logistics and Outsourcing; Logistics Decision Support Systems; Current and Best Practices in Logistics. 3 cr, 3 lec. Prerequisite: BUSI 2604U.

BUSI 3640U Optimization. This introductory course in optimization covers the following topics: structure and classification of optimization problems, branch-and-bound algorithms, linear optimization models, linear programming including geometric interpretations, basic solutions, the simplex method, cutting plane algorithms, and network optimization. Students will use various software packages to apply the optimization techniques to inventory and project management problems. 3 cr, 3 lec. Prerequisite: BUSI 1900U.

BUSI 3660U E- Business in the Supply Chain. Electronic commerce for Supply Chain Management: process automation systems; operations resources management; purchasing systems; buying on the Internet; EDI; electronic catalogs; electronic auctions; electronic markets; buyer/supplier interfaces; cost/benefit analysis; technical issues; international business issues; legal issues; company case studies. 3 cr, 3 lec. Prerequisite: BUSI 2604U.

BUSI 3700U Strategic Management for Professionals. This course examines strategy and related concepts. The focus is on strategic management: choosing and defining purposes and objectives, formulating and implementing a viable strategy, and monitoring strategic performance. The thrust of the course is to view the organization in its totality: the external environment in which it operates, its strategy, and its internal administrative activities. The emphasis is on assessing the kinds of problems and issues that affect the success of the entire organization. 3 cr, 3 lec.

BUSI 3750U Advanced Entrepreneurship. This course covers the process of starting and scaling an enterprise from an idea and business plan into a company. The focus of the course will be on execution: turning a business plan into a high-growth company. 3 cr, 3 lec. Prerequisite: BUSI 2700U.

BUSI 3800U International Business. This course examines the unique opportunities and problems facing companies in the global business environment. Major economic, social, political, legal, and cultural factors affecting international business will be examined. 3 cr, 3 lec. Prerequisite: Completion of all required 2000-level core business courses.

BUSI 3810U International Management. This course examines the international dimensions of business management in foreign countries. Emphasis is placed on the managerial implications of conducting business in the global business environment. The course provides a framework for analysing managerial issues and problems faced by management as a result of economic, cultural, political, and social differences in the global environment. 3 cr, 3 lec. Prerequisite: Completion of all required 2000-level core business courses.

BUSI 3820U International Human Resource Management. The focus of this course is on the strategies involved in managing the human resource needs of an international organization. Students will examine issues such as the effect of cultural differences, the strategic use of technology, managing personnel transitions, and organizational design for global competition. Emphasis will be placed on international human resource strategies and how they can be used as a competitive advantage for the organization. The use of discussion and case analysis will allow students to apply theories from the course. 3 cr, 3 lec. Prerequisites: BUSI 2312U, BUSI 2800U.

BUSI 4101U Advanced Financial Accounting. This course examines complex accounting topics including intercorporate investments and international activities. The application of accounting principles to case situations in specialized industries and nonprofit organizations is also covered. 3 cr, 3 lec, 2 tut. Prerequisite: BUSI 3102U.

BUSI 4140U Contemporary Issues in Accounting. This course concentrates on the application of accounting theory to current and controversial issues in accounting. The topics covered vary with the changing contemporary environment. Students will read from the current accounting literature to gain depth in their appreciation of accounting. The course will include independent research, presentations, and class discussion. 3 cr, 3 lec. Prerequisite: BUSI 4101U.

BUSI 4190U Special Topics in Accounting. This course is an exploration of contemporary issues and topics in accounting. Specific topics and any additional prerequisites will be announced with the schedule each time this course is offered. This course may be retaken with a change in topic to a maximum of 9 credits. 3 cr. Prerequisites: BUSI 2170U and permission of instructor.

BUSI 4199U Directed Independent Studies in Accounting. This is a project-based course as supervised by one or more faculty members on an approved topic related to current trends and issues in accounting. 3 cr. Prerequisites: BUSI 2170U and permission of instructor.

BUSI 4203U Advertising Management. This course focuses on the management of a firm's advertising strategy. Topics include advertising decisions, the advertising campaign, segmentation and positioning, message content, budget allocation, media planning, and the social responsibility of advertising. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 4220U Marketing Strategy. This course focuses on strategic planning and evaluation of marketing decisions in a competitive environment. The purpose of the course is to help students develop analytical abilities by integrating all major areas of marketing. Special emphasis is placed on problem-solving and decision-making in the formulation of marketing strategies. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 4240U Retail Management. This course is an analysis of the principles involved in retail management. Topics include site selection, merchandise display and design, pricing, promotion, human resources management, stock planning, and inventory control. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 4250U International Marketing. This course examines issues in marketing in the international environment. It focuses on economic, political, legal, and cultural factors in international marketing with special emphasis on the formulation of marketing strategies in foreign countries. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 4270U Business to Business Marketing. This course analyses problems and processes in marketing to businesses, governments, and non-profit organizations rather than final consumers. It focuses on the managerial aspects of industrial marketing and the adjustments required for the formulation of marketing strategies. 3 cr, 3 lec. Prerequisite: BUSI 2202U.

BUSI 4290U Special Topics in Marketing. Selected topics of current interest in marketing. 3 cr, 3 lec. Prerequisites: BUSI 2202U and permission of instructor.

BUSI 4299U Directed Independent Studies in Marketing. Independent study in selected marketing topics under the supervision of a faculty member. 3 cr, 3 lec. Prerequisites: BUSI 2202U and permission of instructor.

BUSI 4390U Special Topics in Organizational Behaviour and Human Resources Management. A seminar course in advanced organizational behaviour and human resource topics. The focus of this course is to study current trends and studies in specific areas of organizational behaviour and human resource management. Course content may vary from offering to offering but may include such topics as performance management, organizational behaviour and human resources research methodology, or strategic human resource policy. 3 cr, 3 lec. Prerequisites: BUSI 2312U and one 3000-level human resources related course.

BUSI 4399U Directed Independent Study in Organizational Behaviour and Human Resources Management. Directed study and research under the supervision of a faculty member in an area in which the student has shown particular competence and interest. The focus of this course is to study current trends and studies in specific areas of organizational behaviour and human resource management. This course is normally reserved for students intending to continue their studies and pursue advanced education degrees. 3 cr, 3 lec. Prerequisites: BUSI 2312U and one 3000-level human resources related course, and permission of instructor.

BUSI 4405U Portfolio and Investment Strategies. This course studies the techniques to manage investment portfolios from the perspective of mutual funds and other financial institutions such as insurance companies and trust funds. Investment strategies for fixed income securities, equities, real estate and commodities are evaluated. 3 cr, 3 lec. Prerequisite: BUSI 3405U.

BUSI 4410U Advanced Corporate Finance Applications. This course applies advanced corporate finance topics such as capital budgeting, dividend policy, raising financing, capital structure changes, working capital management, and mergers and acquisitions valuation. Business decision making is simulated in the case study method. 3 cr, 3 lec. Prerequisite: BUSI 3410U.

BUSI 4590U Special Project in E-Business and E-Commerce. This course is an exploration of current issues and topics in e-business and ecommerce. Specific topics and any additional prerequisites will be announced in the schedule each time this course is offered. This course may be retaken with a change in topic to a maximum of 9 credits. 3 cr. Prerequisite: 9 credits in e-commerce related courses.

BUSI 4599U Directed Independent Studies in E-Business and E-Commerce. This is a project-based course as supervised by one or more faculty members on an approved topic related to current trends and issues in e-business and e-commerce. 3 cr. Prerequisites: BUSI 2501U, BUSI 2502U, one 3000-level in e-commerce related courses and permission of instructor.

BUSI 4630U Advanced Logistical Topics in the Supply Chain. As an outcome of the increasing trend towards globalization, logistics is increasingly seen as the critical source of competitive advantage for organizations. Additionally, the Internet offers an alternative route to market and, hence, organizations need to understand its role and how to execute in an online environment. This course moves beyond the basic issues and challenges of logistics to cover more advanced issues which are critical to supply chain performance as perceived by the customer. The issues include: order fulfillment in the last mile, collaboration, technology applications, e.g., RFID, outsourcing, and advanced planning and optimization. Collaboration in the Supply Chain; Business To Business Processes: Outsourcing - Current and Future Issues; Virtual Enterprises; Global Supply Chain Design; International Issues in Logistics Order Fulfillment in the Last Mile of the Supply Chain; Advanced Planning in the Supply Chain Logistics: New Information Technology Applications; Advanced Transportation. 3 cr, 3 lec. Prerequisite: BUSI 3630U.

BUSI 4650U Advanced Supply Chain Management. This course covers strategic role of the supply chain, key strategic drivers of supply chain performance, and the tools and techniques for supply chain analysis. The course presents ways that managers can use in practice for the forefront of supply chain management and information technology in the supply chain. Distribution networks, sourcing and different sourcing activities including supplier assessment, supplier contracts, design collaboration, and procurement; price and revenue management will be discussed. 3 cr , 3 lec. Prerequisite: BUSI 2604U.

BUSI 4652U Supplier Management for Competitive Advantage. The selection, development, and execution of appropriate buyer supplier relationships is the theme of this course. Special emphasis is placed on negotiation, alliance development, and contracting issues in conjunction with ethics and cross-cultural issues. Topics discussed are: Sourcing Strategies: as they relate to market, industry, and supplier dynamics; Contract Issues and Philosophies: Execution of Competitive Bidding (RFQ, RFP, RFI, and SOW) ; Execution of Complex Alliances and Developmental Relationships ; Components of a Negotiation Plan ; Use of Cost and Price Data in the Negotiation Plan Negotiation Execution ; Cross-cultural Issues in Negotiation Planning and Execution. 3 cr 3 lec. Prerequisite: BUSI 2604U.

BUSI 4680U Applied Project Management: Tools and Applications (formerly Decision Making in the Supply Chain, Project Management, Modeling and Simulation). Application of Supply Chain Management methods to a business problem or opportunity. Students work in teams and apply project selection and planning methods to plan a new SCM process, quality improvement, or process re-engineering. This work includes written and oral presentations to business sponsors and use of simulation tools, spreadsheets and project planning software. Topics discussed are: Developing Alternatives; Specifying Performance Metrics; Tradeoff Analysis; Sensitivity Analysis; Process Mapping; Data Collection, Including Interviewing; Specifying a Project Work Breakdown Structure; Developing an Implementation Schedule; Resource Assignment and Levelling, Risk Analysis and Management, Simulation Software,

Modelling/Verification/Analysis of Simulation Studies. Spreadsheet Analysis and Project Planning Software; Presentation Methods. 3 cr, 3 lec. Prerequisite: BUSI 2604U.

BUSI 4690U Special Topics in Supplier Management. This is a last year, last term course that is expected to address the latest trends and developments of emerging technologies and strategies in the field of supplier and supply chain management. Course content may include advanced simulation modelling, strategic decision making, advanced optimization, network flow theory, or strategic vendor management. 3 cr 3 lec. Prerequisites: BUSI 2604U, two 3000-level or 4000-level supplier management courses.

BUSI 4699U Directed Independent Studies in Supplier Management. A student or a group of students work on real or fictitious cases from industry and research to solve a supply chain problem. The project comprises a research component, a case/situation analysis, proposal of a solution. Results are presented through a written report and presentations. It is expected that students make use of the IT tools that they were introduced to in other courses of the specialization. 3 cr, 3 lec. Prerequisites: BUSI 2604U, two 3000-level or 4000-level supplier management courses and consent of the instructor.

BUSI 4701U Strategic Management I. This course examines strategy and related concepts. The focus throughout is on strategic management: choosing and defining purposes and objectives, formulating and implementing a viable strategy, and monitoring strategic performance. The thrust of the course is to view the organization in its totality: the external environment in which it operates, its strategy, and its internal administrative activities. The emphasis is on assessing the kinds of problems and issues that affect the success of the entire organization. Topics include the strategic process, the role of the general manager, the external environment, internal analysis, competitive advantage, strategy and structure, diversification, integrations and alliances, organizational structure, strategy and control, and an introduction to corporate strategy. 3 cr, 3 lec. Prerequisite: Completion of all 3000-level required courses.

BUSI 4702U Strategic Management II. This second level course continues to examine strategy and related concepts. The focus throughout is on strategic management: choosing and defining purposes and objectives, formulating and implementing a viable strategy, and monitoring strategic performance. The thrust of the course is to view the organization in its totality: the external environment in which it operates, its strategy, and its internal administrative activities. The emphasis is on assessing the kinds of problems and issues that affect the success of the entire organization. Topics include the strategic process, the role of the general manager, the external environment, internal analysis, competitive advantage, strategy and structure, diversification, integrations and alliances, organizational structure, strategy and control and an introduction to corporate strategy. 3 cr, 3 lec. Prerequisite: BUSI 4701U.

BUSI 4991U UOIT Edge I - Capstone Study Project. Directed by three faculty advisors (of whom one is the chair for a group's project), and with input from the employer, this is a six month study of an actual organization by groups of six to eight BCom students. The two capstone courses require the comprehensive description and evaluation of an organization and appropriate recommendations for improved performance with the solution of a particular problem or group of problems. The main purpose of this capstone study is to provide students with opportunities to develop a thorough understanding of the technology, environment, markets, and operations of a real organization by applying the theory and knowledge that they have learned. 3 cr, 3 lec. Prerequisites: Completion of all 3000-level required courses and concurrent enrolment in BUSI 4701U.

BUSI 4992U UOIT Edge II - Capstone Study Project. This is a continuation of UOIT Edge I, begun in the previous semester. Student teams continue to study an actual organization. Students will complete a comprehensive analysis and evaluation of an organization and develop appropriate recommendations for improved performance with the solution of a particular problem or group of problems. They will make a formal presentation of their findings and recommendations to faculty advisors and to the management team of the organization. 3 cr, 3 lec. Prerequisite: BUSI 4991U.

CHEM 1010U Chemistry I. The concepts of chemistry including simple reactions and stoichiometry; acids, bases, salts; titration;

gases; atomic and molecular structure and chemical bonding; introduction to nuclear chemistry and the law of radioactive decay. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: OAC or 12U Chemistry (recommended). Credit restriction: CHEM 1800U. Note: Students without the chemistry prerequisite will be responsible for making up background material.

CHEM 1020U Chemistry II. Introduction to the fundamental principles governing chemical transformations. Thermochemistry and thermodynamics (energy, heat, enthalpy, entropy and free energy); the rates of reaction and reaction mechanisms; chemical and ionic equilibria; buffers; introduction to organic chemistry and the reactions of organic compounds; polymer chemistry; redox reactions and electrochemistry. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: CHEM 1010U. Credit restriction: CHEM 1800U.

CHEM 1800U Chemistry for Engineers. Introduction to the four sub-disciplines of modern chemistry: analytical, inorganic, organic and physical. Atoms, molecules, stoichiometry and gas laws; reactions, chemical kinetics, thermochemistry, entropy and free energy; electronic structure of atoms, bonding and molecular structure with emphasis on organic molecules; intermolecular forces, liquids and solids; electrochemistry, fuel cells and electrolytic cells. 3 cr, 3 lec, 2 lab (biweekly), 2 tut (biweekly). Prerequisite: OAC or 4U Chemistry. Credit restrictions: CHEM 1010U, CHEM 1020U.

CHEM 2010U Structure and Bonding. An introduction to modern inorganic chemistry which provides a systematic overview of bonding theories designed to explain molecular arrangements, with emphasis on structure and reactivity. An introduction to transition group elements, as well as the use of modern structural methods to determine composition, structure and bonding. 3 cr, 3 lec, 1 tut. Prerequisites: CHEM 1020U, MATH 1020U, PHY 1020U or PHY 1040U.

CHEM 2020U Introduction to Organic Chemistry. An introduction to the principles and techniques of organic chemistry, including a study of the correlation of reactions and physical properties of organic compounds with structure and energetic concepts; structure, bonding, properties, reactions and synthesis of mono-functional aliphatic and aromatic compounds; stereochemistry and reaction mechanism theory; study of infrared, nuclear magnetic resonance and mass spectroscopy. 3 cr, 3 lec, 4 lab (biweekly), 1.5 tut. Prerequisite: CHEM 1020U.

CHEM 2030U Analytical Chemistry. A study of the principles of analytical chemistry through demonstrations of applications in chemistry, biology, medicine and the study of the environment. Includes: standard analytical chemistry techniques based on chemical equilibrium, volumetric analysis, analytical electrochemistry; use of buffers for pH-control; statistical treatment of analytical data. 3 cr, 3 lec, 3 lab. Prerequisite: CHEM 1020U. Credit restriction: CHEM 2130U. This course is intended for students registered in the chemistry, energy and the environment (chemistry specialization) and forensic science programs.

CHEM 2040U Thermodynamics and Kinetics. Classical thermodynamics: first and second laws, Gibbs and Helmholtz functions, chemical potential; phase diagrams, applications to phase equilibrium in one, two, and many component systems, Gibbs phase rule; phase diagrams for steels and other alloys; behaviour of real gases; steam tables. Chemical kinetics: gas phase kinetics; Arrhenius rates; enzyme kinetics. 3 cr, 3 lec, six 3 hr labs, six 2 hr tut. The tutorials and labs will be in blocks at the beginning and end of the semester, respectively. Prerequisites: CHEM 1020U, MATH 1020U. Credit restrictions: PHY 2050U, CHEM 3140U, ENGR 2640U.

CHEM 2120U Organic Chemistry (formerly CHEM 3020U). Mechanistic analysis of chemical reactivity of common functional groups with a focus on nucleophilic substitutions at carbonyl centers, functional group transformations in organic synthesis; aromatic chemistry, alkanes, alkyl halides, alkynes, alkenes, and alcohols; carbohydrates, amino acids, proteins, heterocycles; applications of spectroscopic techniques. 3 cr, 3 lec, 4 lab. Prerequisite: CHEM 2020U.

CHEM 2130U Analytical Chemistry for Biosciences. A study of the principles of analytical chemistry through demonstrations of applications in chemistry, biology, medicine and the study of the environment. Includes: standard analytical chemistry techniques based on chemical equilibrium, volumetric

analysis, analytical electrochemistry; use of buffers for pH control; statistical treatment of analytical data. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: CHEM 1020U. Credit restrictions: CHEM 2030U. This course is intended for students in biological science programs.

CHEM 3040U Fundamentals of Physical Chemistry. Thermodynamics concepts including solution thermodynamics, phase equilibria, and electrochemistry; transport phenomena, the random walk problem and diffusion; introduction to statistical mechanics including probability distributions and entropy, fluctuations, the Boltzmann distribution, and partition functions and their relation to thermodynamic functions. 3 cr, 3 lec, 3 lab. Prerequisite: CHEM 2040U.

CHEM 3120U Advanced Organic Chemistry (formerly CHEM 4020U). Application of advanced synthetic methodologies used in modern organic synthesis. Emphasis will be placed on the use of retrosynthetic analysis, stereochemical control, and protection/deprotection schemes. 3 cr, 3 lec, 4 lab. Prerequisite: CHEM 3220U.

CHEM 3140U Physical Chemistry for Biosciences. This course provides a study of the principles of physical chemistry, with an orientation to the biological sciences. Topics include: classical thermodynamics, solution thermodynamics, chemical equilibrium, electrochemistry, acids and bases, phase equilibria, chemical kintics, pharmacokinetics, enzyme kinetics, spectroscopy, photobiology, macromolecules. 3 cr, 3 lec, 1 oth. Prerequisites: CHEM 1020U, MATH 1020U. Credit restrictions: CHEM 2040U, PHY 2050U.

CHEM 3220U Structure Determination of Organic Molecules. This course explores the theory and the application of mass spectrometry, and NMR, ultraviolet/visible, and IR spectroscopy to the structure determination of organic molecules. 3 cr, 3 lec. Prerequisite: CHEM 2120U.

CHEM 3510U Inorganic Chemistry I. Detailed treatments of inorganic and organometallic coordination chemistry of the transition and main group elements; the emphasis is on structure, bonding, and reactivity; solid state chemistry; acid-base chemistry; inorganic chemistry in non-aqueous media. The lab portion of this course will emphasize the use of modern structural methods to determine composition, structure and bonding. 3 cr, 3 lec, 3 lab. Prerequisite: CHEM 2010U. Note: Students are expected to take CHEM 3520U in the following semester.

CHEM 3520U Inorganic Chemistry II. A continuation of the lecture and laboratory topics of Inorganic Chemistry I. Spectroscopy of metal complexes, reaction mechanisms of d-block complexes, d-block organometallic complexes, catalysis; introduction to bioinorganic chemistry. 3 cr, 3 lec, 3 lab. Prerequisite: CHEM 3510U. Note: Students are expected to take this course immediately after CHEM 3510U.

CHEM 3530U Instrumental Analytical Chemistry I. Instrumental methods of trace chemical analysis. This course deals with the scope and use of instruments in chemical analysis, and the theory and applications of atomic and molecular spectroscopy. A range of analytical techniques is examined including atomic absorption and emission, mass spectrometry, x-ray spectroscopy, ultraviolet/visible spectroscopy, infrared, Raman and nuclear magnetic resonance spectroscopy. 3 cr, 2 lec, 4 lab (weekly). Prerequisite: CHEM 2030U. Credit restriction: CHEM 3830U. Note: Students are expected to take CHEM 3540U in the following semester.

CHEM 3540U Instrumental Analytical Chemistry II. A continuation of Instrumental Analytical Chemistry I. This course deals with the theory and applications of electroanalytical chemistry, separation methods involving chromatography, thermal and radiochemical methods. A range of analytical techniques is examined including potentiometry, coulometry, voltammetry, gas chromatography, liquid chromatography, capillary electrophoresis, and differential thermal analysis. 3 cr, 2 lec, 4 lab (weekly), 2 tut. Prerequisite: CHEM 3530U. Credit restriction: CHEM 3830U. Note: Students are expected to take this course immediately after CHEM 3530U.

CHEM 3830U Instrumental Analytical Chemistry. A one-semester course dealing with instrumental methods of trace chemical analysis. The theory and applications of ultraviolet/visible, infrared and atomic absorption spectroscopy are described. Other common techniques are examined, including X-ray fluorescence, mass spectrometry, gas chro-

matography, nuclear activation analysis and high performance liquid chromatography. 3 cr, 3 lec, 1 tut. Prerequisite: CHEM 2030U or CHEM 2130U. Credit restrictions: CHEM 3530U, CHEM 3540U.

CHEM 4010U Industrial Chemistry. An introduction to the principles and practices of industrial chemistry with a survey of the chemical industry, pollution control, plant design, corrosion and similar topics. Selected industrial processes will be discussed, such as production of primary petrochemicals; plastics and synthetic fibres; pharmaceutical agents; insecticides, herbicides and insect pheromones, dyes, detergents, perfumes and flavours. 3 cr, 3 lec. Prerequisites: CHEM 3520U, CHEM 2120U.

CHEM 4040U Physical Chemistry. An introduction to phenomena at surfaces and interfaces: colloids, adsorption, thermodynamic treatments and examples of technological applications. The course describes modern methods to characterize surfaces in materials science and chemical dynamics at electrode interfaces. 3 cr, 3 lec, 3 lab. Prerequisite: CHEM 3040U. Recommended prerequisites: MATH 2050U, MATH 2060U.

CHEM 4050U Environmental Chemistry. Major chemical pollutants: their sources, the environmental reactions they undergo, and how they become distributed throughout the environment. Topics will be chosen from the major environmental toxicants: pesticides, natural products, inorganics, and industrial chemicals. The course explores the principal means of chemical and biological degradation of toxicants, and the processes by which chemicals move, concentrate, and dissipate. The details of the chemistry occurring in the earth's atmosphere are examined. 3 cr, 3 lec. Prerequisites: CHEM 2020U, CHEM 3830U or CHEM 3540U.

CHEM 4060U Chemical and Molecular Spectroscopy. Interaction of light with matter including transition moments and selection rules; matrix methods; electron and nuclear magnetic resonance (Bloch equation and the rotating frame approximation); detailed study of rotation, vibration and electronic spectroscopy, including quantum mechanical models, line broadening, hyperfine and quadrupole coupling; introduction to group theory in chemistry. 3 cr, 3 lec. Prerequisite: CHEM 3040U. Strongly recommended prerequisites: MATH 2050U, MATH 2060U.

CHEM 4070U Fossil Fuels and Biomass. This course will address future world energy needs and sources and focus on the continued use of fossil fuels and the use of biomass, especially in developing countries. Students will study origins and compositions and conventional processing of these sources of energy. Topics will also include the production of ethanol and methane from biomass; origins, effects and methods of reducing acid rain; CO2 and enhanced greenhouse gas effect; and the concept of total cost analysis, with some simple examples. 3 cr, 3 lec, 2 tut. Prerequisites: CHEM 2020U; (CHEM 2040U or PHY 2050U), ENVS 2010U, ENVS 3020U.

CHEM 4110U Bio-Organic Chemistry. This course will explore the structure and function of biological molecules including proteins, nucleic acids, carbohydrates, lipids, and alkaloids. Pharmaceutical implications will also be discussed. 3 cr, 3 lec. Prerequisite: CHEM 2120U.

CHEM 4120U Advanced Topics in Biological Chemistry. This course will explore a range of current research topics at the intersection of chemistry and biology that are recently reported in the scientific literature. The course covers the following topics: protein engineering, enzymology, enzymatic synthesis, biotransformations, and bio-inorganic chemistry. 3 cr, 3 lec. Prerequisite: CHEM 4110U.

CHEM 4410U Chemistry Thesis Project I. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study and to satisfy specific objectives and requirements. The project will be selected to include research that has been approved by the supervising faculty member. Students will submit a progress report at the end the first semester. Once all work is completed, each student must submit a thesis and make a presentation based on their research in the following semester. 3 cr, 9 oth. Prerequisite: Students will have completed 90 credit hours in their area of specialization and be in clear standing, and must obtain prior consent of a faculty member. Note: Students are expected to take CHEM 4420U in the following semester.

CHEM 4420U Chemistry Thesis Project II. A continuation of the project started in CHEM 4410U. Students will make presentations based on their research and submit a written

thesis. 3 cr, 9 oth. Prerequisite CHEM 4410U. Note: students are expected to take this course immediately after CHEM 4410U.

CHEM 4430U Directed Studies in Chemistry. This course requires independent research of a current topic in a specialized area of chemistry, including, but not restricted to, organic, inorganic, physical, analytical and computational chemistry. The topic will be selected from the recent research literature and involve a review and critical appraisal of underlying experimental principles. The course comprises independent library research, participation in weekly meetings, and written and oral presentations. 3 cr, 1 lec, 2 oth. Prerequisite: Students will have completed 90 credits in their area of specialization and be in clear standing. Note: Students are expected to take this course in one semester and a science elective as specified in the program map to complete the honours requirement.

CHEM 4510U Pharmaceutical Discovery. This course explores topics in the drug discovery process from the discovery of lead molecular candidates to their optimization as drug candidates. Topics include natural products drug discovery; combinatorial chemistry; medicinal synthetic organic chemistry. 3 cr, 3 lec. Prerequisite: CHEM 3120U.

CHEM 4520U Advanced Topics in Pharmaceutical Chemistry. This course covers current research topics in pharmaceutical chemistry with a focus on techniques that facilitate a drug candidate's entry into the marketplace. Topics include molecular modelling, pharmacokinetics, and pharmaceutics. 3 cr, 3 lec. Prerequisite: CHEM 4510U.

CSCI 1000U Scientific Computing Tools. This course provides a working introduction to software tools employed in the scientific workplace, and used in the UOIT science programs. Modules will be included on: data management (spreadsheets, databases), computational tools (Maple, MATLAB), scientific text processing and graphics (LaTeX, SigmaPlot, and others), presentation tools (PowerPoint, LaTeX), introductory Linux, and various other software tools useful in different branches of science. Part of the course grade will include a student presentation. 3 cr; this course is offered in a hybrid format, involving 1.5 lec, 2 tut and online self-learning material. Prerequisite: Enrolment in a Science program, or background and interest in science. Credit Restriction: CSCI 1800U.

CSCI 1020U Fundamentals of Programming (formerly CSCI 1600U). This course provides a basic introduction to computer programming using an object-oriented approach. Topics include basic computer architecture, control and basic data structures, objects, class libraries, organizational approaches, and the design and implementation of standard algorithms. 3 cr, 3 lec, 2 tut. Prerequisite: CSCI 1000U. Credit Restrictions: BUSI 1830U, ENGR 1200U, CSCI 1600U.

CSCI 1800U Computing Tools for Health Science. This course covers the use of various software tools for use in the UOIT web-centric and laptop environment in certain programs within the Faculty of Health Science. It may be taken in place of CSCI1000U (Scientific Computing Tools) by students in the Health Science program who are not planning on taking physics or mathematics courses. Modules will be included on: scientific graphing, document processing and basic graphics tools, data management (spreadsheets & databases), web authoring tools, and scientific presentations. Most of the software items are pre-installed on the laptops, but some will be accessed remotely via the web. Practical use and application of the tools will include health related situations. 3 cr; this course is offered in a hybrid format, involving 1.5 lec, 2 tut and online self-learning material. Prerequisite: Enrolment in the Health Science program, or background and interest in Science. Credit Restriction: CSCI1000U.

CSCI 2010U Principles of Computer Science. This course introduces students to general computer programming principles and the analysis of algorithms and data structures. Topics include problem analysis, design of algorithms and programs, selection of data types, decision-making, and program correctness. The course uses an object-oriented programming language such as Java or C++. Applications to business, science and engineering are illustrated. The focus is on the effective choice of algorithm and data structure and the use of a disciplined programming style which permits programs to be understood and read by others. 3 cr, 3 lec, 1 tut. Prerequisite: CSCI 1020U. Corequisite: CSCI 2110U or MATH 2080U.

CSCI 2020U Software Systems Development and Integration. This course is an introduction to the tools and techniques used in modern software development. Topics covered include configuration management, software design, coding standards, software testing and maintenance, basic software tools, software libraries, graphical user interfaces and network programming. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 2010U, CSCI 2050U.

CSCI 2050U Computer Architecture I. This course introduces the basic ideas of computer organization and underlying digital logic that implements a computer system. Starting from representation of information, the course looks at logic elements used for storing and processing information. The course also discusses how the information storage and processing elements are linked together to function as a computer system. Students become familiar with the basic hardware components of a system and how they are connected, and see how secondary storage, registers and control units must coordinate to provide an effective environment for application programming. The components of a multi-level memory, and how it interfaces with the I/O and central processor, are examined. 3 cr, 3 lec, 2 lab. Corequisites: CSCI 2010U, CSCI 2110U or MATH 2080U.

CSCI 2110U Discrete Structures in Computer Science (formerly CSCI 1010U). This course provides a foundation in finite mathematics which is required for advanced computing science courses. For example, an ability to derive and comprehend a formal proof is essential in formal specification and cryptography. Set theory concepts are used in software engineering and image processing. Students will acquire the ability to recognize formal proofs of correctness and use various standard proof techniques to prove properties about programs and the correctness of simple graph theory algorithms. Induction proofs and recursive algorithms are introduced. The course provides students with the expertise and knowledge to appreciate the significance of the complexity of an algorithm and the relationship to the time it takes to solve a problem. Small problems are introduced and worst-case and average case analysis discussed. Formal proofs and counting arguments are presented as essential tools for the analysis of algorithms. The course facilitates appreciation of time/space trade-offs associated with algorithm design and implementation. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1000U, MATH 1020U. Corequisite: MATH 1850U or MATH 2050U. Credit restrictions: CSCI 1010U, MATH 2080U, ENGR 2110U.

CSCI 2160U Digital Media. This course is an introduction to the representation and processing of media in a digital form. The media covered includes sound, image, video, text, and graphics. Topics covered in this course include sampling, storage and file structures, reproduction, and the processing of different forms of media. Standard software packages for the handling of digital media are also covered. 3 cr, 3 lec, 2 lab. Prerequisites: CSCI 2010U, CSCI 2050U.

CSCI 3010U Simulation and Modelling. This course provides a basic introduction to simulation and modelling. The goal is to provide the student with an appreciation of the role of simulation in various scientific, engineering, and business fields, and to provide some experience in writing simulation programs. This course exposes students to a class of applications which require and demand massive data storage and computational power to make large scale simulations possible. They gain an understanding of the need for parallel and vector processors to solve these problems. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1020U, MATH 2072U, STAT 2010U.

CSCI 3020U Operating Systems. This course will cover a variety of topics related to computer operating systems, with emphasis on components that are unique to the role of an operating system as the interface layer between the computer hardware and the application software. The course will discuss techniques for sharing the processor, memory, secondary storage and networking between programs. The basics of networking will also be introduced, particularly involving higher protocol levels. Students will learn about the limitations of single processor architecture. This course also familiarizes students with the protocols and network communication techniques that are used to make the overall system reliable and robust. 3 cr, 3 lec, 3 lab (biweekly). Prerequisites: CSCI 2010U, CSCI 2050U. Credit Restriction: ENGR 3950U.

CSCI 3030U Database Systems and Concepts. The aim of the course is to provide students with an overview of database management system architectures and environments, an understanding of basic database design and implementation techniques, and practical experience of designing and building a relational database. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1010U, CSCI 2010U, CSCI 2020U, CSCI 2050U. Corequisite CSCI3020U.

CSCI 3040U System Analysis and Design in Applications. This course introduces students to the development of software systems that consist of multiple programs with long life cycles. Students learn to think in terms of the data required by a system and the programs that are used to manipulate it. Topics covered in this course include file design, basic database programming, notations and techniques for describing system structure, and system development methodologies. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 2010U, CSCI 2020U.

CSCI 3050U Computer Architecture II. Advanced architecture concepts, such as multi-level memory, caching and vector processors, are introduced in this course so that students are able to appreciate the difficult and complex task involved in the compilation of a high level language. Students become familiar with differing hardware designs and the need for an architecture-independent compiler writing technique. They gain an understanding of the need for such language and machine independent techniques. The tools and formalism introduced for compiler construction, while new, are closely related to the formal notation and proof techniques introduced in earlier courses. 3 cr, 3 lec, 2 lab. Prerequisites: CSCI 2050U, CSCI 3020U.

CSCI 3060U Software Engineering. Building on previous software design courses, this course concentrates on the rigorous development of software systems. It concentrates on formal tools and techniques that are used in software design and development. In addition, it explores some of the new ideas and methodologies in software engineering. Some of the topics covered in this course include formal software design methodologies, software requirements, formal specification techniques, object oriented design, design patterns and extreme programming. A major team project is an important feature of this course. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1010U or CSCI 2110U or MATH 2080U or ENGR 2110U, CSCI 2020U, CSCI 3040U.

CSCI 3070U Analysis and Design of Algorithms. This course exposes students to the fundamental techniques for designing efficient computer algorithms, proving their correctness, and analysing their complexity. It provides students with the expertise to analyse the cost of solving a specific problem with a given algorithm. Classical algorithms are analysed in detail and their relative performance (depending on the 'size' of the problem) predicted. Generic efficient techniques such as recursion, divide and conquer, "greedy" strategies and branch and bound are studied and their relative costs identified. Such a toolbox of effective techniques is necessary for the design and analysis of realistic algorithms to solve important problems in all application areas. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1010U, CSCI 1020U, CSCI 2010U. Credit Restriction: ENGR 3770U.

CSCI 3090U Scientific Visualization and Computer Graphics. This course provides a basic introduction to computer graphics and scientific visualization. Basic properties of display devices, graphics objects, and common graphics operations will be identified. The use of colour, texture, lighting and surface/contour plots will be surveyed. Examples from modelling of PDEs will be presented. 3 cr, 3 lec, 2 lab. Prerequisites: CSCI 2010U, MATH 2072U. Credit Restriction: ENGR 4860U.

CSCI 3150U Computer Networks. Network history and architectures; reference Model for Open systems Interconnection (OSI): descriptions, examples, and applications; bridges, routers, gateways; routing, multicast deliver; TCP/IP protocol suite; transmission media (wired and wireless), network topologies (ring, bus, tree, star, mesh); local area networks, Ethernet, Token passing, wireless LAN, personal LAN, WAN; communication network management; ATM and BISDN, the Internet: from services to security. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: CSCI 2050U. Credit Restriction: ENGR 4650U.

CSCI 4020U Compilers. This course provides a detailed study of the compilation process for a procedural language. Students will develop an understanding of compiler design and put these principles into practice through the construction of a fully functioning compiler for a small procedural language using widely available tools for compiler construction and a general-purpose programming language. 3 cr, 3 lec, 1 tut. Prerequisites: CSCI 3020U, CSCI 3050U. Credit Restriction: ENGR 3960U.

CSCI 4040U Ethics, Law and the Social Impacts of Computing. This course is an examination of the impact that computing has on society and the impact that society has on computing. The development of laws and social mechanisms has not kept pace with the rapid development and deployment of computing and computing devices in our society. The ethics to deal with this situation exist but are not widely studied by students of computing. Current issues, developments and trends in computing ethics and law will be examined. The impact that computing has on society will be examined in light of the need for professional ethics and appropriate laws and regulatory agencies. 3 cr, 3 lec, 2 tut. Prerequisite: CSCI 3060U.

CSCI 4100U Mobile Devices. This course is an introduction to developing applications for mobile devices including cell phones, PDAs, and mobile games. It covers the hardware architecture of mobile devices, wireless networks, communications protocols, software architecture, and application design and development. 3 cr, 3 lec, 2 lab. Prerequisites: CSCI 2160U, CSCI 2020U.

CSCI 4110U Advanced Computer Graphics. This course covers more advanced topics in computer graphics including rendering algorithms, computer animation, programmable graphics displays, and graphical interaction. Students in the course will produce an animation or an interactive graphics application. 3 cr, 3 lec, 2 lab. Prerequisite: CSCI 3090U.

CSCI 4160U Interactive Media. This course is an introduction to interactive media including computer games, interactive stories, and educational software. 3 cr, 3 lec, 2 lab. Prerequisites: CSCI 2160U, CSCI 3090U.

CSCI 4400U Thesis Project. The thesis project provides students with the opportunity to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project may comprise an individual or group design project, or an individual research project. The tutorial sessions will be used for instruction in communications, and will involve individual student presentations. A written document by each student is required before the end of the term. 3 cr, 3 oth. Prerequisite: Clear standing in fourth year of the computing science program.

CSCI 4610U Artificial Intelligence. This course introduces students to the fundamental concepts and techniques of artificial intelligence. Topics include: fundamental definitions and philosophical questions; search and constraint satisfaction; knowledge representation and reasoning; advanced search techniques; agents; machine learning and neural networks; AI planning systems. 3 cr, 3 lec. Prerequisites: CSCI 1010U, CSCI 2010U, CSCI 3020U, CSCI 3070U, STAT 2010U.

CSCI 4620U Human-Computer Interaction. This course provides an introduction to human-computer interaction (HCI), with emphasis placed on understanding human behaviour with interactive objects, general knowledge of HCI design issues, and a human-centred approach to software design. The course will stress the design of usable interfaces, including the consideration of cognitive factors and social contexts within which computer systems are used. Students will receive an introduction to HCI while applying this theory to a design project. 3 cr, 2 lec, 2 tut. Prerequisite: CSCI 3060U. Credit Restriction: ENGR 4859U.

CSCI 4630U High Performance Computing. This course allows the student to explore issues in high-performance computing, specifically in the areas of parallel software design and programming. The major paradigms of parallel architectures and parallel complexity will be covered. Topics covered include: current trends in high performance computing (grid computing, etc.), parallel programming models, parallel programming with MPI, designing parallel systems, efficiency and debugging, performance analysis and profiling, parallel complexity theory, applications in scientific computing. 3 cr, 2 lec, 2 tut. Prerequisites: CSCI 3010U, CSCI 3020U, CSCI 3050U, CSCI 3060U.

CSCI 4640U Distributed Computing. This course exposes the student to the major paradigms of distributed computing, from sockets to client/server to web services and grid computing. Topics covered include: distributed computing paradigms and models, distributed databases and storage issues, security (including encryption, certificates, attacks, authentication, authorization, digital signatures, firewalls, access control lists, capability access), Internet issues: name services, DNS, web services, grid computing; Globus, OGSA, project management in distributed computing, testing and performance, and design issues including in-depth coverage of techniques such as sockets, threads, Java RMI, Corba, Tomcat, servelets, and Globus. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 3020U, CSCI 3030U, CSCI 3060U. Credit Restriction: ENGR 4790U.

CSCI 4650U Elements of Theory of Computation. Provides and develops an understanding of which problems are inherently computable and which problems are tractable or feasible. Topics include: Church's thesis, recursively enumerable sets, Godel's incompleteness theorem and the relationships of these results to complexity results involving Turing machine models and P vs. NP hardness. 3 cr, 3 lec, 1 tut. Prerequisite: CSCI 3070U.

CURS 3410U Math Technology Camp I/S. A mathematics camp will be the main focus of the first week of classes for Intermediate-Senior teacher candidates taking math as one of their teachable subjects. This camp will immerse teacher candidates in rich and exciting mathematics experiences, rather than giving them specific content knowledge. It is intended to raise candidates' expectations of what it means to do math and to give them a personal experiential base with which to reflect on theory and practice throughout their education program. The week will emphasize enjoyable experiences and discovery-oriented activities intended to familiarize the candidates with "thinking like" mathematicians. 0 cr, 1 week workshop.

CURS 3510U Math Technology Camp P/J. A mathematics camp will be the main focus of the first week of classes. This camp will immerse teacher candidates in rich and exciting mathematics experiences rather than giving them specific content knowledge. It is intended to raise candidates' expectations of what it means to do math and to use technology and to give them a personal experiential base with which to reflect on theory and practice throughout their education program. The week will emphasize enjoyable experiences and discovery-oriented activities intended to familiarize the candidates with "thinking like" mathematicians. 1.5 cr, 1 week workshop.

CURS 3511U Science Technology Camp P/J. A science camp in the second semester will be an extension of the earlier math camp. This camp will immerse teacher candidates in rich and exciting science experiences rather than giving them specific content knowledge. It is intended to raise candidates' expectations of what it means to do science and to use technology and to give them a personal experiential base with which to reflect on theory and practice throughout their education program. The week will emphasize enjoyable experiences and discovery- oriented activities intended to familiarize the candidates with "thinking like" scientists. 1.5 cr, 1 week workshop.

CURS 3610U Math Technology Workshop I/S. Mathematics workshops will be the main focus of the first week of classes for Intermediate-Senior teacher candidates not taking math as one of their teachable subjects. This camp will give candidates a personal experiential base with which to reflect on theory and practice throughout their education program. The week will emphasize enjoyable experiences and discovery-oriented activities intended to familiarize the candidates with "thinking like" mathematicians. 0 cr, 1 week workshop.

CURS 3611U Science Technology Camp I/S. A science camp in the second semester will be an extension of the earlier math camp. This camp will immerse all I/S teacher candidates in rich and exciting science experiences rather than giving them specific content knowledge. It is intended to raise candidates' expectations of what it means to do science and to use technology and to give them a personal experiential base with which to reflect on theory and practice throughout their education program. The week will emphasize enjoyable experiences and discovery- oriented activities intended to familiarize the candidates with "thinking like" scientists. 0 cr, 1 week workshop.

CURS 4000U Core Curriculum Methods - I/S. This course is an overview of approaches to teaching and learning in grades 7-12 with specific emphasis on planning (year long, unit and lesson plans) and communication techniques (parent-teacher interviews, verbal and non-verbal communication). The course includes an examination of related curriculum documents and supporting resources, as well as a review of current research and theory related to teaching strategies and classroom practices. The emphasis will be on methods and approaches that have broad applicability across curriculum areas. 1.5 cr, 3 lec.

CURS 4100U Curriculum Studies I: Biology. A study of the general principles of lesson design and development to be used in the teaching of biology in the Intermediate and Senior divisions. Topics will include the content in science and biology courses taught in these divisions, relevant Ontario Ministry of Education guidelines, policies and resource documents, teaching philosophies, as well as instructional and assessment techniques (for both classroom and laboratory contexts) appropriate to the subject and level. 3 cr, 3 lec, 1 lab.

CURS 4101U Curriculum Studies II: Biology. This course will expand upon the foundation provided in the Biology Curriculum Studies I course by continuing the examination of teaching methods and materials that are appropriate for the teaching of biology topics in Grades 11 and 12. Students will develop units of instruction and laboratory activities as well as learn a variety of assessment techniques for evaluating student progress. 3 cr, 3 lec, 1 lab. Prerequisite: CURS 4100U.

CURS 4110U Curriculum Studies I: English. A study of the general principles of curriculum design and development. Students will learn the forces that shape the curriculum and ways in which designers seek to address the needs of learners and society while being guided by the discipline of the subject. Particular attention will be given to the curriculum and teaching of English in the intermediate and Senior Divisions. Topics include: content in English courses taught in these divisions, relevant Ontario Ministry of Education guidelines, policies and resource documents, teaching philosophies, instructional and assessment techniques (for both classroom and laboratory contexts) appropriate to the subject and level. 3 cr, 4 lec.

CURS 4111U Curriculum Studies II: English. This course will expand upon the foundation provided in the English Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of English in the intermediate and senior grades. Students will explore the development of lessons and units of instruction for particular topics in the Ontario English curriculum and will learn a variety of assessment techniques for use in evaluating student progress and for curriculum development. Special attention will be given to the integration of English with other areas of instruction. 3 cr, 4 lec. Prerequisite: CURS 4110U.

CURS 4120U Curriculum Studies I: Chemistry. This course is a study of the general principles of curriculum design and development. Students will learn about the forces that shape the curriculum and the ways in which teachers seek to address the needs of learners and other educational stakeholders. Particular attention will be given to the curriculum and teaching strategies for general science in the Intermediate Division and Chemistry in the Senior Divisions. Topics include: motivation of learners, constructivism, analysis of curriculum documents and other Ministry of Education policy, lesson planning and an introduction to assessment and evaluation. 3 cr, 2 lec, 2 lab.

CURS 4121U Curriculum Studies II: Chemistry. This course will expand upon the foundation provided in the Chemistry Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of chemistry in grades 11 and 12. Students will explore the development of lessons and units of instruction for particular topics in the Ontario Chemistry curriculum and will learn a variety of assessment techniques for use in evaluating student progress and for curriculum development. Lab safety, lab-based teaching and the use of technology in teaching lab skills will be foci of the course. 3 cr, 2 lec, 2 lab. Prerequisite: CURS 4120U.

CURS 4130U Curriculum Studies I: Physics. This course is a study of the general principles of curriculum design and development. Students will learn about the forces that shape the curriculum and the ways in which teachers seek to address the needs of learners and other educational stakeholders.

Particular attention will be given to the curriculum and teaching strategies for general science at the Intermediate Division and Physics in the Senior Divisions. Topics include: motivation of learners, constructivism, analysis of curriculum documents and other Ministry of Education policy, lesson planning and an introduction to assessment and evaluation. 3 cr, 2 lec, 2 lab.

CURS 4131U Curriculum Studies II: Physics. This course will expand upon the foundation provided in the Chemistry Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of chemistry in grades 11 and 12. Students will explore the development of lessons and units of instruction for particular topics in the Ontario Physics curriculum and will learn a variety of assessment techniques for use in evaluating student progress and for curriculum development. Lab safety, lab-based teaching and the use of technology in teaching lab skills will be foci of the course. 3 cr, 2 lec, 2 lab. Prerequisite: CURS 4130U.

CURS 4140U Curriculum Studies I: Mathematics. A study of the general principles of curriculum design and development. Students will learn the forces that shape the curriculum and ways in which designers seek to address the needs of learners and society while being guided by the discipline of the subject matter. Particular attention will be given to the curriculum and the teaching of mathematics in the Intermediate and Senior Divisions. Topics will include: mathematics content in courses taught in these divisions, relevant Ontario Ministry of Education guidelines, policies and resource documents, teaching philosophies, instructional and assessment techniques appropriate to mathematics. 3 cr, 4 lec.

CURS 4141U Curriculum Studies II: Mathematics. This course will expand upon the foundation provided in the Mathematics Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of mathematics in the intermediate and senior grades. Students will explore the development of lessons and units of instruction for particular topics in the Ontario mathematics curriculum and will learn a variety of assessment techniques for use in evaluating student progress and for curriculum development. Special attention will be given to the integration of mathematics with other areas of instruction. 3 cr, 4 lec. Prerequisite: CURS 4140U.

CURS 4150U Curriculum Studies I: Visual Arts. A study of the general principles of curriculum design and development and their implementation in a Visual Arts classroom. Students will learn the forces that shape the curriculum and ways in which designers seek to address the needs of learners and society while being guided by the discipline of the subject. Particular attention will be given to the curriculum and teaching of visual arts in the Intermediate and Senior Divisions. Topics include: content in visual arts courses taught in these divisions, relevant Ontario Ministry of Education guidelines, policies and resource documents, teaching philosophies, instructional and assessment techniques (for both classroom and laboratory contexts) appropriate to the subject and level. 3 cr, 4 lec.

CURS 4151U Curriculum Studies II: Visual Arts. This course will expand upon the foundation provided in the Visual Arts Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of visual arts in the intermediate and senior grades. Students will explore the development of lessons and units of instruction for particular topics in the Ontario visual arts curriculum and will learn a variety of assessment techniques for use in evaluating student progress and for curriculum development. Special attention will be given to the integration of visual arts with other areas of instruction. 3 cr, 4 lec. Prerequisite: CURS 4150U.

CURS 4160U Curriculum Studies I: Computer Studies. A study of the general principles of curriculum design and development and their implementation in the Intermediate/Senior computer science classroom. Teacher candidates will learn the ways in which teachers seek to address the needs of learners and society while being guided by the discipline of the subject. Topics will include: the key concepts of courses in computer technology and informational science, relevant Ontario Ministry of Education guidelines, policies and resource documents and instructional techniques for classroom contexts appropriate to

the subject. Teacher candidates will determine appropriate expectations and build lessons around them, make presentations to the class, and generate activities using Lego Mindstorms to enhance pedagogical creativity. 3 cr, 4 lec.

CURS 4161U Curriculum Studies II: Computer Studies. A continued study of the general principles of curriculum design and development. This course will expand upon the foundation provided in the Computer Science Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of computer science and computer engineering in the high school environment. Assessment techniques will also be examined. Teacher candidates will further explore the development of lessons planning for particular topics in the Ontario curriculum, as well as devise whole units of study. Teacher candidates will make additional presentations to the class, create activities using electronics kits, and practice their assessment skills. 3 cr, 4 lec. Prerequisite: CURS 4160U.

CURS 4180U Curriculum Studies I: General Science. This course constitutes a study of the general principles of curriculum design and development for general science teaching. Students will learn the forces that shape the curriculum and ways in which designers seek to address the needs of learners and society while being guided by the discipline of the subject. Particular attention will be given to the curriculum and the teaching of general science subjects in the Intermediate and Senior Divisions. Topics will include: content of the science courses taught in these divisions, relevant Ontario Ministry of Education guidelines, policy and resource documents, teaching philosophies, instructional and assessment techniques (for both classroom and laboratory contexts) appropriate to the subject. 3 cr, 3 lec, 1 lab.

CURS 4181U Curriculum Studies II: General Science. This course will expand upon the foundation provided in the General Science Curriculum Studies I course by extending the examination of teaching methods and materials that are appropriate for the teaching of general science in the intermediate and senior grades. Students will explore the development of lessons and units of instruction for particular topics in the Ontario science curriculum and will learn a variety of assessment techniques for use in evaluating student progress and for curriculum development. Special attention will be given to the integration of science with other areas of instruction. Current issues in general science teaching/learning, project-based teaching and the use of technology in teaching will be foci of the course. 3 cr, 3 lec, 1lab. Prerequisite: CURS 4180U.

CURS 4200U Core Curriculum I - P/J. This course provides teacher candidates with an overview of approaches to teaching and learning in grades JK to 6. Planning (long range, unit and lesson) and communication skills of skills will be emphasized. The course will include an examination of related curriculum documents and supporting resources as well as a review of current research and theory related to teaching strategies and classroom practices. The emphasis will be on methods and approaches that have broad applicability across curriculum areas. 2.25 cr, 3 lec.

CURS 4201U Core Curriculum II - P/J. This course provides teacher candidates with an extended study of approaches to teaching and learning in grades JK to 6. The course will include an examination of related curriculum documents and supporting resources as well as a review of current research and theory related to teaching strategies and classroom practices. The emphasis will be on methods and approaches that have broad applicability across curriculum areas, with a focus on assessment and evaluation strategies. 2.25 cr, 3 lec, Prerequisite: CURS 4200U.

CURS 4210U Curriculum Studies: Language Arts I - P/J. This course provides teacher candidates with an overview of teaching and learning the English Language Arts (speaking, listening, reading, writing, viewing, and representing) from JK to grade 6. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject-related theory, teaching and assessment strategies, and classroom practices. 2.25 cr, 3 lec.

CURS 4211U Curriculum Studies: Language Arts II - P/J. This course provides teacher candidates with an extended study of teaching and learning the English Language Arts (speaking, listening, reading, writing, viewing, and representing) from JK to grade 6. The cur-

riculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject- related theory, teaching and assessment strategies, and classroom practices. 2.25 cr, 3 lec. Prerequisite: CURS 4210U.

CURS 4240U Curriculum Studies: Mathematics I - P/J. This course provides teacher candidates with an overview of the teaching and learning of mathematics, grades JK-6. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject related theory, teaching and assessment strategies, and classroom practices. 1.5 cr, 2 lec.

CURS 4241U Curriculum Studies: Mathematics II - P/J. This course provides teacher candidates with an extended study of the teaching and learning of mathematics, grades JK-6. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject related theory, teaching and assessment strategies, and classroom practices. 1.5 cr, 2 lec. Prerequisite: CURS 4240U.

CURS 4251U Curriculum Studies: Visual Arts, Music, Drama, Dance - P/J. The arts are an integral part of a student's education and education in the arts is essential to a student's intellectual, social, physical and emotional development. "Through the study of the arts, students learn about artistic traditions of their own and other cultures. They develop the ability to communicate in various artistic media, and learn to understand that the arts have long served as important media for recording and communicating ideas and feelings" (The Ontario Curriculum, Grades 1-8: The Arts, p. 5). This course provides teacher candidates with an extended study of teaching and learning Music, K - 6, with a focus on developing an understanding and appreciation of the creative process in an integrated and learner-centred classroom. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject-related theory, teaching strategies, and classroom practices. Drama will be integrated throughout the course. 1.5 cr, 3 lec.

CURS 4271U Curriculum Studies: Social Studies - P/J. Social studies may be defined as the historical, social, cultural, economic, political, and environmental aspects of societies past, present and future. This course provides teacher candidates with an overview of teaching and learning in social studies, history and geography from grades 1 - 6. Social studies is divided into two strands: Heritage and Citizenship plus Canada and World Connections. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject-related theory, teaching strategies, and classroom practices. 1.5 cr, 2 lec.

CURS 4280U Curriculum Studies: Science and Technology I - P/J. This course is intended to provide teacher candidates with an overview of teaching and learning Science and Technology from JK to grade 6. Candidates will be provided with the knowledge and scientific processes needed to develop a thorough understanding of the science concepts. This course will be presented in a manner which models a discovery approach and includes the knowledge and skills necessary to design an inquiry-oriented, activity-based, hands-on interactive program. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject- related theory, teaching strategies, and classroom practices. 1.5 cr, 2 lec.

CURS 4281U Curriculum Studies: Science and Technology II - P/J. This course is intended to provide teacher candidates with an extended study of teaching and learning Science and Technology from JK to grade 6. Candidates will be provided with the knowledge and scientific processes needed to develop a thorough understanding of the science concepts. This course will be presented in a manner which models a discovery approach and includes the knowledge and skills necessary to design an inquiry-oriented, activity-based, hands-on interactive program. The curriculum content will include a review of related curriculum documents and supporting resources as well as a review of current subject- related theory, teaching strategies, and classroom practices. 1.5 cr, 2 lec. Prerequisite: CURS 4280U.

CURS 4291U Curriculum Studies: Health and Physical Education - P/J. This course provides teacher candidates with an overview of teaching healthy living, fundamental movement skills, and active participation, the three strands in the health and physical education curriculum. The curriculum content will include a review of related curriculum documents and supporting resources as well as links to other subjects and the application of the skills to life experiences. 1.5 cr, 2 lec.

ECON 2010U Microeconomics. As a first course in economics, microeconomics introduces the student to principles such as scarcity, opportunity cost, diminishing returns, elasticity, industrial organization, economies to scale, and concentration. The course begins with an introduction to the market and price determination. The course reviews the cost structure of the firm in both the long and short run. Price and quantity decisions for firms in various competitive situations are discussed. Canada's Competition Act is examined. The course also analyses the markets for factors of production. 3 cr, 3 lec.

ECON 2020U Macroeconomics. As an introductory course in economics, macroeconomics introduces the student to principles such as unemployment, inflation, economic growth, the multiplier, equilibrium, fiscal policy, and monetary policy. The student builds on the knowledge of the market from microeconomics and proceeds to an understanding of aggregate demand and supply. The principle of money and banking are introduced along with the role of the Bank of Canada. The course also introduces the student to the principles of international trade theory. 3 cr, 3 lec. Prerequisite: ECON 2010U.

EDUC 1050U Technical Communications. This course will assist students in developing professional writing and presentation skills required for university assignments and for their professional work in the future. It will start with basic writing and speaking skills and will emphasize their application in the preparation of reports and other technical writing. Topics for the course include using correct grammar and punctuation, organizing ideas, formulating persuasive arguments, and preparing narrative and written technical reports. Part of the process will involve students in the critical analysis of the writing and speaking of others as a means of developing one's own skills. 3 cr, 3 lec, 1 tut.

EDUC 1200U History of Science and Technology. This course will focus on the history and philosophy of science and engineering with special emphasis on scientific technology and the cultural significance of technology to civilization. The course will include critical analyses and will pay significant attention on the nature and problems of industrial technology, benefits and risks of technological progress, and issues around intellectual property. Throughout, students will examine the history and philosophy within the context of science and engineering as learned professions. 3 cr, 3 lec.

EDUC 1470U Impact of Science and Technology on Society. In this course, students will engage in analyses of scientific and technological developments from the perspective of broad social impacts. Special attention will be paid to controversial issues currently receiving media attention, but the major emphasis will be on ways of thinking critically about both the remediation of already existing problems (e.g., toxic substance cleanup) and the prevention of future problems (e.g., environmental impact analyses and or economic impact analyses). Canadian examples will be of primary concern, but students will also learn to think about impact globally since large-scale problems do not respect political boundaries. 3 cr, 3 lec.

EDUC 2900U Introduction to Teaching and Field Experience I. In this first course in education, concurrent science/education students will be introduced to the profession of teaching through the Standards of Teaching and Ethical Standards as set out by the Ontario College of Teachers. They will begin their development as professionals through ample practice in reflection and the initial development of a professional portfolio. They will study, reflect and communicate their understanding of how school cultures and learner diversity affect learning and then shape teacher practices through observation, case studies and other instructional material. This course includes a two-week field experience in an elementary school at the end of the academic year. In preparation for this field study, students will be introduced to the Ontario Curriculum Policy documents. They will be initiated in the key elements of teacher practice: lesson plans, diversity of learners, classroom management and communication as professionals. They will collaborate with each other

through the establishment of an online learning community as they discuss issues and assignments that arise from class and as they as they go out in the field in their practicum, they will share curriculum resources and the use of technology that will serve to integrate curriculum expectations with teaching practice. Weekly class hours: 2 hours + two-week (10 days) field experience at the end of the academic year. 3 cr.

EDUC 2901U Field Experience II. The second field study is designed to provide concurrent science/education students with a three-week field experience in secondary schools at the end of their second academic year. This will help them to develop an understanding of and appreciation for the school culture and the professional community of which they will be a part. Under the guidance of professional associate teachers in the field and faculty advisors, teacher candidates will engage in guided observations and interactions with students. Prerequisite: EDUC 2900U. Weekly class hours: 1 hour + three-week (15 days) field experience at the end of the academic year.

EDUC 3400U Technology in I/S Education. This course focuses on how to use technology, how to teach technology and how to teach with technology. Teacher candidates will gain advanced technology skills in the areas of web site production, digital image and video editing, digital presentation delivery, desktop publishing, Internet searching and peripheral devices. Practical lab-based experiences allow teacher candidates to apply knowledge and skills to be effective problem solvers with technology. This course will also allow for exploration with new technologies to support learning in the classroom. 1.5 cr, 4 lec.

EDUC 3450U Teaching Kindergarten. This course provides teacher candidates with an overview of teaching and learning at the Kindergarten level. The content will include a review of related curriculum documents and supporting resources as well as a review of current theory, teaching strategies, and classroom practices at the Kindergarten level. 3 cr, 3 lec, 1 oth (online).

EDUC 3460U Problem Based Learning. The course introduces an approach to teaching that focuses on the value of learning from real and meaningful activities. Candidates will learn to find and structure activities around the kind of "ill-defined" problems that faces professionals in their work and they will learn to use these activities as the basis for promoting self-directed inquiry. 3 cr, 3 lec, 1 oth (online).

EDUC 3470U Issues in Education. This elective explores current issues in educational practice and policy in the context of their social foundations. By examining research literature and current data, teacher candidates will analyze contemporary and, at times, controversial topics and their impact on education. While the course will stress Ontario issues, one purpose will be to help the students to understand these issues in the context of related questions. 3 cr, 3 lec, 1 oth (online).

EDUC 3480U Outdoor and Experiential Education. Through integrating curricula (JK – 12), interdisciplinary studies and locally developed courses, teacher candidates will examine the knowledge, skills and values necessary to develop and implement outdoor and experiential educational programs in any setting. Teacher candidates will concentrate on ways to develop their own leadership and facilitation skills in settings that will allow them to offer dynamic experiential curricula. Teacher candidates will spend a minimum of two to three weekend days in a variety of outdoor and alternative education environments while attending 2 hours a week in local outdoor activities. This course is intended to facilitate the integration of conventional teacher education and preparation for leading dynamic school and community-based outdoor, nature-oriented education activities. An additional course fee will cover admissions, transportation and material costs. 3 cr, 2 lec, plus some weekends.

EDUC 3500U Technology in P/J Education. This course focuses on how to use technology, how to teach technology and how to teach with technology. Teacher candidates will gain core technology skills in the areas of file management, Internet searching, digital image and video editing, digital presentation delivery, desktop publishing, digital storytelling, multimedia development. Practical lab-based experiences allow teacher candidates to apply knowledge and skills to be effective problem solvers with technology. This course will also allow for exploration with new technologies to support learning in the classroom 1.5 cr, 3 lec.

EDUC 3560U Religious Education: Teaching in Ontario Catholic Schools. This course, which is compulsory for teacher candidates who want to teach in Ontario Catholic Schools, is designed to enhance the professional knowledge, understanding and skills of teacher candidates whose preference is that of Ontario Catholic schools. They will study ways in which curriculum can be designed to reflect the philosophy and values of the Catholic system and examine the relation between educational principles and everyday classroom practices. 3 cr, 3 lec, 1 oth (online).

EDUC 3610U Contemporary Educational Practice. The course introduces teacher candidates to the basic legal issues related to teaching in the publicly-funded school systems in Ontario. Teachers must be aware of their rights and obligations as defined in legislation. They must also understand how education is delivered to pupils in Ontario and the basic structure supporting that delivery. These rights and obligations, combined with the legal structure and processes, have a direct impact on the relationships between teachers and pupils, teachers and their colleagues in education, and teachers and the community. The course addresses Ontario education law, related legislation (acts and regulations) and policy including the Constitution Acts (1867 and 1982), the Education Act, The Ontario College of Teachers Act, the Teaching Profession Act, the Labour Relations Act, the Trespass to Property Act, the Municipal Freedom of Information and Protection of Privacy Act, and the legislation regarding workplace health and safety. 3 cr, 3 lec, 1 oth (online).

EDUC 3750U Learning and Human Development. There are two parts to this course. In the first module students will examine the physical, cognitive, social and emotional development of children in the context of family, peers, school, work and culture. Material will focus mainly on the adolescent age group. The second module will focus on traditional learning theories and contemporary learning research with special emphasis on classroom applications. Teacher candidates will be introduced to some of the historically important theories of learning and will critique contemporary views of learning from an understanding of the older views. The course will include literary as well as sociopsychological portrayals of adolescence. Topics include: theories of adolescence, physiological and cognitive development; social, emotional and personality development; the contexts of adolescent development; adolescent problems/challenges and methods of coping. 3 cr, 3 lec, 1 oth (online).

EDUC 3800U Teaching for Individual Needs and Diversity. This 18-hour course focuses on strategies to address special needs of students within the regular classroom. It introduces different types of special needs encountered in the elementary and secondary schools and examines the instructional and assessment strategies most likely to succeed with these learners. The course includes review of legislation and required procedures such as Individual Education Plans (IEPs) and Identification, Placement and Review Committees (IPRC). Techniques for modifying testing situations and course materials are also addressed. Students are encouraged to see effective partnerships with parents and other professionals as essential to effective learning and integration. Another focus in the course is the increasing diversity of the regular classroom-gender and racial differences, ESL, patterns of family life, religious beliefs, socioeconomic status, etc. Students will explore ways to address such differences so that they are accepted and respected. 1.5 cr, 2 lec.

EDUC 4240U Understanding Educational Research, Theory and Practice. This course is designed to introduce teacher candidates to the diverse approaches to knowledge production that make up educational research. The course highlights a variety of forms of disciplined inquiry used in a wide range of research disciplines. The emphasis in this course is on reading and understanding research with a focus on examining the potential implications for teaching practice. The course provides teacher candidates with the opportunity to understand the various approaches to educational research in terms of underlying principles such as generalizability, reproducibility and logical coherence. The course assists teacher candidates to begin the process of using educational research and reflective practice to construct, document and inform their own professional practice. 1.5 cr, 2 lec.

EDUC 4250U Philosophical Foundations: Historical and Social Context of Catholic Education. This course introduces teacher candidates to the historical, philosophical and sociological foundations of Catholic education in Ontario. Implications for understanding the multifaceted nature of contemporary schooling in Ontario, the role of Catholic schools and teachers and the legal/legislative foundation of religious education are emphasized and explored. The intent of the course is thus to offer resources and experiences through which an adequate foundation for professional teaching in Ontario Catholic Schools can be developed. 3 cr, 3 lec, 1 oth (online).

EDUC 4260U Independent Study. This course is intended to provide students with the opportunity to pursue topics that are of academic interest to them personally under the supervision of a qualified faculty member who is willing to support the work. Students wishing to take advantage of this option must present a potential faculty supervisor with a proposal for the study that includes a statement of the intended learning outcomes, a listing of the planned learning activities (e.g., a list of readings, media sources to be consulted, plans for acquiring new data (if appropriate), and proposed writing assignments. Together, the student and faculty member must agree on due dates and criteria for the marking of assignments for the independent study. A letter of agreement between the student and the faculty member must be submitted with the proposal to the dean of the faculty (or designee) for approval. Independent study courses may not be used in lieu of existing courses as program requirements. In some circumstances, independent studies may be used in lieu of elective courses (e.g., if the student already has ample background in the electives available). Independent study courses will be available only to students who are currently enrolled in an academic program at the University of Ontario Institute of Technology. 3 cr.

EDUC 4380U Analysis and Management of Classroom Behaviour. This course provides teacher candidates a realistic overview of the variables that are operative in classrooms and provides strategies for optimizing the learning environment. Approaches to dealing with student misbehaviour will be addressed in a variety of ways including case studies, role-playing and guest speakers. A wide range of behaviourial, emotional and academic problems will be discussed in the context of important dimensions such as teacher age and experience, other teacher characteristics, age of students, subject matter and type of class (e.g. regular classroom vs. lab). Students will be expected to develop a personalized approach to effective classroom management that builds on the issues identified in the course, field experience and research. 1.5 cr, 3 lec.

EDUC 4590U Assessment and Evaluation. This course will focus on issues in assessment and evaluation with an emphasis on the Ontario education system. A variety of assessment strategies will be explored along with examples of use, as well as construction of rubrics, portfolios, checklists, rating scales, quizzes etc. Evaluation concepts and methodologies will also be part of the course, with students being exposed to reporting techniques and issues. 1.5 cr, 2 lec.

EDUC 4610U Advanced Instructional Design. This elective course presents systematic approaches to answering questions about how instruction should be designed. Students will learn processes for the analysis of learning needs, contexts and tasks as well as techniques for choosing and developing instructional materials and media. A theoretical framework for designing instruction will be applied through the creation of several digital and paper-based based applications. The course includes attention to design of instruction for non-school settings. 3 cr, 3 lec, 1 oth (online).

EDUC 4900U I/S Field Experience I (Practicum). Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. This involves observation periods, practice teaching opportunities and a weekly field experience class to prepare teacher candidates for these field experiences. Weekly class hours: 2 hrs.

EDUC 4901U I/S Field Experience II (Practicum). Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. This involves observation

periods, practice teaching opportunities and a weekly field experience class to prepare teacher candidates for these field experiences. Weekly class hours: 2 hr. Prerequisite: EDUC 4900U.

EDUC 4902U 1/S Field Experience III (Practicum). This third field experience for concurrent science/education students, involves observation periods, practice teaching opportunities and a weekly field experience class to prepare teacher candidates for these field experiences. Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. Weekly class hours: 1 hr. + four-week (20 days) field experience at the end of the academic year. Prerequisite: EDUC 2901U.

EDUC 4903U I/S Field Experience IV (Practicum). Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. This fourth field experience for concurrent science/education students, involves observation periods, practice teaching opportunities and a weekly field experience seminar to prepare teacher candidates for these field experiences. Weekly class hours: 2 hrs. + field experience. Prerequisite: EDUC 4902U.

EDUC 4904U I/S Field Experience V (Practicum). Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. This fifth field experience for concurrent science/education students, involves observation periods, practice teaching opportunities and a weekly field experience seminar to prepare teacher candidates for these field experiences. Weekly class hours: 2 hrs. + field experience. Prerequisite: EDUC 4903U.

EDUC 4910U P/J Field Experience I (Practicum). Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. This involves observation periods, practice teaching opportunities and a weekly field experience class to prepare teacher candidates for these field experiences. Weekly class hours: 2 hrs.

EDUC 4911U P/J Field Experience II (Practicum). Placements in schools are designed to provide teacher candidates with opportunities for growth as successful teachers and learners under the guidance of professional associate teachers in the field and faculty advisors. This involves observation periods, practice teaching opportunities and a weekly field experience class to prepare teacher candidates for these field experiences. Weekly class hours: 2 hr. Prerequisite: EDUC 4910U.

ENGR 0998U Engineering Internship Program. An optional internship work term for students in engineering and applied science programs aimed at providing significant professional experience and exposure to an engineering workplace. The work term is between 12 and 16 months duration, normally commencing in May and concluding by August of the following year. Registration in this course is conditional on the student obtaining and accepting an acceptable internship placement offer from an approved employer partner. Interns are visited/ contacted as required by the course coordinator to assess their progress. Internship students are required to submit a report, following established criteria, within one month of completing the internship placement. The course is graded on a pass/fail basis and the grade appears in the student's academic transcript. Both grades have no numerical value and are not included in a student's grade point average. Prerequisite: Completion of three years of the academic program with a cumulative GPA of at least 2.3 and permission of the faculty.

ENGR 0999U Engineering Co-op Program. An optional co-op work term for students in engineering and applied science programs aimed at providing significant professional experience and exposure to an engineering workplace. The duration of the work term is between two and four months, normally during the summer. Registration in this course is conditional on the student obtaining and accepting an acceptable co-op placement offer from an approved employer partner. Co-op students are required to submit a report, following established criteria, within one month of completing the co-op placement.

The course is graded on a pass/fail basis and the grade appears in the student's academic transcript. Both grades have no numerical value and are not included in a student's grade point average. A student can take this course more than once. Prerequisite: Permission of the faculty.

ENGR 1200U Introduction to Programming for Engineers. Introduction to the anatomy of a computer: CPU, memory, machine cycle, input and output devices, data representation; Fundamental programming concepts: flowcharting, algorithm design, use of procedures, program control flow, arrays and vectors, arithmetic and logic operations, input and output, data declaration; Principles of object oriented programming: classes, inheritance. Programming in 'C++'. 3 cr, 3 lec, 2 tut.

ENGR 1400U Information Technology for Engineers. IT: principles, state-of-the-art, opportunities, and trends; IT applications: science, engineering, and daily life; informatics; computer hardware: I/O devices, semiconductor memory, secondary storage devices, CPU, peripheral equipment; computer software: application and system software, including operating systems, utilities; web browsers; analog-to-digital conversion; multimedia systems and digital compression techniques: PCM, MP3, MPEG, JPEG, Lempel-Ziv, Huffman coding techniques; the Internet; wired and wireless media, networks, and architectures; broadband technologies (DSL and cable modems), introductory design concepts and telecommunications design tradeoffs: bandwidth, power, performance, cost, complexity; IT design criteria and constraints, IT security. 3 cr, 3 lec.

ENGR 2010U Thermodynamic Cycles. A study of the basic concepts involved in thermodynamics, including: nature of thermodynamics; First Law of Thermodynamics; Second Law of Thermodynamics; properties and behaviour of pure substances; ideal gases and mixtures; equation of state for a perfect gas; Carnot and Rankine Cycles; thermodynamic efficiency; steam tables and charts; superheating and reheating; regenerative feedwater heating; conventional and nuclear steam cycles; heat exchanger thermal balance; steam turbine expansion lines; and steam generator thermal characteristics. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: PHY 1010U, MATH 1020U.

ENGR 2020U Statics and Dynamics. This course provides fundamental engineering knowledge of static and dynamic force/moment equilibrium and time-varying performance of different systems. It also examines the work, energy, impact, force, and kinematics and dynamics of systems of particles and rigid bodies. The course description consists of: resultant and equilibrium of force systems; distributed loads; hydrostatics; conditions of equilibrium and application to particles and rigid bodies; analysis of statically determinate structures including beams, trusses and arches; friction; centroid; principle of virtual work; Cartesian, normal-tangential, and polar components of velocity and acceleration in two and three dimensions; rotating frames; kinematics of particles and rigid bodies; force/acceleration; work/energy; impulse/momentum; conservative and nonconservative systems; systems of streams of particles and rigid bodies; introduction to three dimensional problems of particles and rigid body dynamics. 3 cr, 4 lec, 2 tut. Prerequisites: MATH 1020U, MATH 1850U, PHY 1010U.

ENGR 2110U Discrete Mathematics for Engineers. Sets and set operations, propositional logic, predicate logic, rules of inference; methods of proof and reasoning, modular arithmetic, counting, pigeon-hole principle, induction, deduction, relations, functions, graphs, graph algorithms, shortest path, trees, combinatorics; applications to cryptosystems, hashing functions, coding. 3 cr, 3 lec, 2 tut. Prerequisites: MATH 1850U, MATH 1020U.

ENGR 2140U Problem Solving, Modelling and Simulation. Students will explore processes and skills needed to define, evaluate and develop a range of solutions to design problems while working alone or as members of a group. Topics include: methods for estimating and verifying the results and levels of accuracy of alternate designs; mathematical modelling of simple processes and equipment; computer programs for solving systems of equations; use of simulation in the design and visualization of continuous and discrete process. 3 cr, 2 lec, 2 tut. Prerequisites: MATH 1020U, PHY 1020U, ENGR 1200U. Corequisite: MATH 2860U.

ENGR 2200U Electrical Engineering Fundamentals. Coulomb's, Ohm's, and Kirchoff's laws; electrostatics and electromagnetics; resistance, capacitance, inductance; series and parallel circuits, independent and dependent voltage and current sources; energy, power; Superposition, Thevenin, and Norton Theorems; DC and AC; initial, steady state and transient conditions; frequency selective circuits and resonance; poly-phase circuits and transformers. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisites: PHY 1020U, MATH 1020U.

ENGR 2220U Structure and Properties of Materials. Atomic structure and atomic bonding in solids, structure of crystalline solids, solidification and defects, alloys and phase diagrams, mechanical properties of metals and alloys, semiconductors, organics, polymers, crystalline ceramics, glass and fibre optics, composites, biomaterials, magnetic materials. 3 cr, 3 lec. Prerequisite: CHEM 1800U or CHEM 1020U.

ENGR 2250U Introductory Electronics. Conduction in semiconductors; single-time constant networks; operational amplifiers; diodes; non-linear circuit applications; bipolar junction and field-effect transistors; transistor amplifiers; small and large signal models; amplifier frequency response and analysis; multi-stage amplifiers; filters and oscillators; digital logic, integrated and memory circuits. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 2200U.

ENGR 2260U Statics and Solid Mechanics. This course provides fundamental engineering knowledge of static systems, bodies at rest, force and moment equilibrium of rigid bodies, and mechanics of materials and deformable bodies. Course topics include: forces; moments of forces; couples; resultant and equilibrium of force systems; distributed loads; equilibrium of particles and rigid bodies; analysis of structures including beams, trusses, frames and machines; mechanical joints; centroid; moment of inertia; plane stress and strain; tension and compression test; Hooke's law; Poisson's ratio; axial load; principle of superposition; thermal stress; torsion of circular shafts; pure bending; transverse shear; shear stress in beams and thin-walled members; combined loading; stress and strain transformations; Mohr's circle; design of beams and shafts; deflections of beams and shafts; statically indeterminate beams and shafts; buckling of columns. 3 cr, 4 lec, 2 lab (biweekly), 2 tut. Prerequisites: PHY 1010U, MATH 1020U.

ENGR 2310U Concurrent Engineering and Design. This course covers the modern integrated product development process. Unlike the traditional product development approach, concurrent (simultaneous) engineering and design reunites technical and non-technical disciplines and brings forward a philosophy of cross-functional cooperation in order to create products which meet predetermined objectives, and are better, less expensive, and more quickly brought to market. It is a process in which appropriate disciplines are committed to work interactively to analyse market and customer requirements in order to improve the end-to-end process by which products are conceived, designed, manufactured, assembled, sold to the customer, serviced, and finally disposed of. The concept of design is presented. Brainstorming, creativity methods, design for manufacturing, design for assembly, design for cost, and design for quality, life cycle design, reverse engineering, and rapid prototyping are addressed. Teamwork and communication skills are developed. 3 cr, 3 lec, 2 lab. Prerequisite: ENGR 3200U.

ENGR 2320U Thermodynamics. Introductory concepts and definitions; energy, work and heat; the nature of thermodynamics; the First Law of Thermodynamics; the Second Law of Thermodynamics; control mass and control volume analyses; properties and behaviour of pure substances; ideal gases and mixtures; equation of state for a perfect gas; irreversible and reversible processes; the Carnot cycle; entropy; Clausius inequality; entropy change in open and closed systems; isentropic processes; introduction to exergy; power and refrigeration cycles. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: PHY 1010U.

ENGR 2330U Mechanical Equipment and Systems. Heating, cooling and refrigeration systems; fluid systems; pumps, compressors, turbines; valves; piping design; pressure vessels; gear and flexible drive systems; bolted and welded joints; heat exchangers and shields; measurements in mechanical systems of solids and fluids; free and forced vibration, single- plane and two-plane balancing of rotating machines, mechanism balanc-

ing; preventive, predictive and corrective maintenance; lifecycle aspects of mechanical equipment and systems. 3 cr, 3 lec, 2 lab (biweekly). Prerequisite: ENGR 2640U or ENGR 2860U.

ENGR 2340U Engineering Operations and Project Management I. An introduction to the functional area of production and operations management as practiced in engineering and manufacturing industries and the services sector. It includes decision-making, engineering project management, facility layout in engineering, manufacturing and services industries, waiting lines, quality control, just-in-time systems, forecasting, aggregate planning, inventory management, materials requirements planning and operations scheduling. 3 cr, 3 lec.

ENGR 2350U Engineering Operations and Project Management II. A second level course that continues to study the functional area of production and operations management as practiced in engineering and manufacturing industries and the services sector. It includes decision-making, engineering project management, facility layout in engineering, manufacturing and services industries, waiting lines, quality control, just-in-time systems, forecasting, aggregate planning, inventory management, materials requirements planning and operations scheduling. 3 cr, 3 lec. Prerequisite: ENGR 2340U.

ENGR 2360U Electric Power Systems. Power system overview: generation, transmission, and distribution; elements of power systems: inductors, transformers, generators, circuit breakers, transmission lines, DC machines, AC machines, synchronous machines; single- and three-phase systems; equivalent circuits, operating modes; network calculations: power flow, active and reactive power, fault analysis and protection, power system stability. 3 cr, 3 lec, 2 tut (biweekly). Prerequisite: ENGR 2790U.

ENGR 2420U Solid Mechanics. Design of mechanical joints; elasto-plastic torsion of circular sections; elasto-plastic bending of beams; residual stresses, shearing stresses in beams, analysis of plane stress and plain strain problems; pressure vessels, design of members of strength criteria, deflection of beams; indeterminate structures. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 2020U.

ENGR 2430U Dynamics. This course provides fundamental engineering knowledge of time varying systems. It also examines the kinematics and kinetics of particles and rigid bodies. Course topics include: kinematics of particles; rectilinear and curvilinear motions; Cartesian, normal-tangential, polar and cylindrical components of velocity and acceleration in two and three dimensions; planar kinematics of rigid bodies; general plane motion; rotating frames; kinetics of particles; kinetics of systems of particles; planar kinetics of rigid bodies; force and acceleration; friction; work and energy; conservative and non-conservative systems; impulse and momentum; introduction to three-dimensional kinematics of a rigid body. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 2260U, MATH 1850U.

ENGR 2450U Digital Systems. Boolean algebra and truth tables; combinational logics: AND, OR, NOT, XOR gates; sequential circuits: flip-flops, counters, memory circuits; logic circuit analysis, synthesis, and optimization; A/D and D/A interfaces; ROM and RAM; Field Programmable Gate Array (FPGA) and Application Specific Integrated Circuits (ASIC). 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 2110U.

ENGR 2490U Software Project Management. Software engineering course with emphasis on advanced methods and procedures for managing a software development project. Includes project planning, scheduling, and cost estimation, project organizational types, staffing and training considerations, leading and motivating computer personnel, and methods for measuring and controlling a project. Emphasizes IEEE software engineering management standards and keys to project success. Class project required. 3 cr, 3 lec, 3 tut. Prerequisites: BUSI 2000U, ENGR 2710U.

ENGR 2500U Introduction to Nuclear Physics. An introduction to nuclear and reactor physics. Topics include: elements of relativity, radioactivity, alpha, beta and gamma decay.; binding energy, interaction of radiation with matter; neutron cross sections, neutron scattering and absorption; fission; fusion; neutron density and flux, neutron diffusion, diffusion equation; neutron multiplication factor and reactivity, reactor equation, four and six factor formulae, neutron flux distribution, flux flattening, nuclear energy and applications of radioisotopes in various fields. 3 cr, 3 lec, 1 tut. Prerequisites: PHY 1020U, MATH 1020U.

ENGR 2520U Fundamentals of Electromagnetics. Vector analysis, including orthogonal coordinate systems, and the calculus of field quantities; electrostatic fields including the concepts of electric potential, capacitance, and current and current density; magnetostatic fields including inductance; time-varying fields and the complete form of Maxwell's equations; basic transmission line phenomena including steady-state sinusoidal behaviour and standing waves, transient performance and impedance matching. 3 cr, 3 lec, 2 tut. Prerequisites: ENGR 2200U, MATH 2860.

ENGR 2530U Complex Analysis for Engineers. Basic complex analysis; complex numbers and topology of the complex plane, continuity and differentiability of complex functions, power series and convergence tests, elementary complex functions, contour integration, Cauchy theorem and Cauchy integral formula, Taylor and Laurent series, residue theorem; applications selected from evaluation of real integrals, planar flows and potential theory, Laplace transform and inversion by residues, transform solution of ordinary differential equations with constant coefficients. Applications to engineering systems. 3 cr, 3 lec, 2 tut. Prerequisite: MATH 2860.

ENGR 2640U Thermodynamics and Heat Transfer. Nature of thermodynamics, First Law of Thermodynamics, Second Law of Thermodynamics. Control mass and control volume analyses. Properties and behaviour of pure substances. Ideal gases and mixtures; equation of state for a perfect gas. Introduction to conduction, convection and radiation. Solutions to steady-state and transient conduction problems. Free and forced convection for laminar and turbulent flows. Thermal radiation between black bodies. Introduction to heat exchangers.3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: PHY 1010U, MATH 1020U.

ENGR 2710U Software Design I. Building on the foundation laid in the introductory programming course the concepts of object orientation is explored in depth and commonly used data structures will be studied. The software design and development process is introduced. The course also introduces object-oriented analysis and design using the unified modelling language (UML). Examples from a variety of every day and engineering problems are used to further the conceptual understanding of the material. The content outline by topic is as follows: principles of object oriented programming; data structures: lists, stacks, queues, trees, search trees, binary trees, graphs; code, debug, analyse, maintain and document programs using techniques of good programming style; basic and advanced aspects of abstraction, recursion, parameter passing, file I/O and classes; object libraries and packages and encapsulation of the fundamental data structures in these object libraries; object interaction, including messaging, association, and composition; object-oriented analysis and design using the unified modelling language (UML). 3 cr, 3 lec, 2 tut. Prerequisite: ENGR 1200U.

ENGR 2720U Software Design II. Customer/user communication; requirements specifications, modelling, UML. Specifically, the course focuses on the use of various UML diagrams including use case, class conceptual, class specification, sequence, and activity. Both internal and external software documentation, verification/validation, reliability, introduction to quality assurance and testing methods; Implementations of larger projects will be emphasized. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 2710U.

ENGR 2790U Electric Circuits. Basic concepts of electricity, magnetism and electric circuits; DC and AC driven circuits; series and parallel circuits; Ohm's Law, Kirchhoff's Laws, Thevenin's Theorem, Norton's Theorem, operation of electrical equipment such as instruments, motors, generators; response to step functions; response to sinusoids, steady-state AC, resonance, parallel resonance, AC power, power factor, power factor correction; introduction to magnetic circuits: coils, solenoids, transformers; single and three phase circuits, basic operation of electrical measuring equipment; basics of electronics: diodes, transistors, operational amplifiers. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: PHY 1020U, MATH 1020U.

ENGR 2860U Fluid Mechanics. Fundamentals of fluid mechanics, including: properties of fluids and their units; fluid static. Kinematics of fluids, conservation of mass and the continuity equation. Dynamics of fluids; Euler's equation; Bernoulli's equation. The energy equation; energy grade lines. Flow of viscous fluids; laminar and turbulent flows; flow in

pipes and fittings; the Moody diagram. Flows around immersed bodies; lift and drag on bodies. Boundary layers; flow separation. Flow measurement techniques. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: PHY 1010U, MATH 1020U.

ENGR 2950U Radiation Protection. Defines and introduces basic concepts in radiation safety; dose limits and risk; protection from external radiation: time, decay and distance, shielding, access control; external radiation hazards; radiation surveys; internal radiation hazards; behaviour of internal sources, annual limit on intake, derived air concentration for tritium, radioiodines, particulates; bioassay; contamination control; basic principles of radiation dosimetry; calculation of internal and external body radiation exposures; regulations concerning radioactive materials; safe working with radiation. 3 cr, 3 lec, 2 lab (biweekly). Prerequisite: ENGR 2500U.

ENGR 3000U Automotive Component Design. Component design of powertrain: manual and automatic transmissions, transfer case, planetary gears, final drive including differential lock system, propshaft, synchronizing element, helical and bevel gears. Design of transmission systems; need for an automatic transmission, function of manual and automatic transmission system; design of planetary gear train transmissions, and peripheral components; Hydraulic power supply, electronic and hydraulic controls in automatic transmissions; transmission arrangements and performance characteristics; chassis design. Heating and cooling systems design for passenger comfort; design of engine cooling and exhaust systems. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 3030U, ENGR 4260U.

ENGR 3030U Computer-Aided Design. Geometric/solid modelling, computer graphics and feature modelling. Finite element analysis, discretization and modelling, selection of elements, treatment of boundary conditions, checking for accuracy. Design optimization, optimization models, algorithms for optimization. State-of-the-art software packages will be introduced and case studies will be employed. 3 cr, 4 lec, 2 lab. Prerequisites: ENGR 2310U, ENGR 2260U or ENGR 2420U.

ENGR 3070U Probability and Random Signals. Continuous and discrete random variables; probability density and distribution functions; joint and conditional probability functions; transformation of variables; Chebyshev's inequality and law of large numbers; central limit theorem and Chernoff bounds; white/colour, additive/multiplicative Gaussian/non-Gaussian noise; random processes; stationarity and ergodicity; autocorrelation function and power spectral density; noise in linear/non-linear band-limited low-pass/ band-pass systems. 3 cr, 3 lec, 2 tut. Prerequisite: ENGR 3110U.

ENGR 3110U Signals and Systems. Linear, time invariant systems; impulse response and transfer function; auto-correlation and power spectrum; convolution; Fourier series; Laplace transforms and Fourier transforms; discrete-time signals and systems; Z-transforms and discrete Fourier transforms; poles and zeros, stability of analog and digital filters. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 2530U.

ENGR 3130U Communication Systems. Signal types and systems classifications; Fourier and Hilbert transforms; amplitude modulation (AM, DSBSC, SSB, VSB); frequency modulation; sampling and quantization; A/D and D/A conversions, pulse modulation: PAM, PPM, PDM; Nyquist-I criterion and ISI; adaptive equalization; partial response signalling; binary digital modulation: BASK, BFSK, BPSK; source coding and channel coding fundamentals. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3110U.

ENGR 3140U Computer Architecture. Computer systems generation: main-frame, mid-range, micro-computers; peripherals and interfaces; bus design; input/output systems and technologies; central processing units: arithmetic logic and control units; semiconductor memory (RAM and ROM), magnetic disks and tapes, optical disks; assembly and high-level programming language; integer and floating point arithmetic, pipelining and parallelism; CISC vs. RISC. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 2450U.

ENGR 3190U Manufacturing and Production Processes. The role and characterization of manufacturing technology within the manufacturing enterprise is studied. Topics include an overview of the deformation process, joining processes, consolidation processes, material removal processes, and material alteration processes; process selection and planning; just-in-time production; computer control of manufacturing systems. 3 cr, 3 lec, 3 lab

(biweekly). Prerequisites: ENGR 2220U, ENGR 2310U.

ENGR 3200U Engineering Graphics and Design. Engineering drawing techniques, dimensions and geometric tolerances, standard viewpoints and section planes, orthographic projections, use of 3-D solid modeling and CAD software (and possibly other design and graphics software); a case-based introduction to engineering design; use of graphics and illustrations in engineering design; design projects by individuals and groups; basics of project management, such as organizing, planning, scheduling and controlling; application of such computer tools as spreadsheets, project management software, computer-aided drafting and design tools. 3 cr, 3 lec, 1.5 lab, 1.5 tut.

ENGR 3210U Mechanical Vibrations. Fundamental concepts of vibrations of mechanical systems; free vibrations of single degree of freedom systems; various types of damping and vibration absorption; forced vibrations; vibration measuring instruments; steady state and transient vibrations; vibrations of multidegree of freedom systems; vibration isolation; modal analysis; vibrations of continuous systems; introduction to non-linear vibrations, including non-linear springs and non-linear damping. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 2430U or ENGR 2020U.

ENGR 3220U Machine Design. Theory and methodology related to conceptual design; review of the methods used in stress analysis; simple design factor approach; variable loads; stress concentrations; bolts and bolted joints; welded joints; springs; shaft and bearing design; brakes and braking systems; design for recycling; reliability, maintenance and cost considerations. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 3270U, ENGR 2310U, ENGR 2260U or ENGR 2420U.

ENGR 3230U Electronic Circuit Design. Circuit analysis principles and bode plots; types of filters; frequency transformations; feedback amplifier analysis; stability and compensation techniques for amplifiers using negative feedback; transistor amplifiers, differential and multistage amplifier, integrated circuit biasing techniques; power amplifiers, tuned amplifiers; op-amp applications; oscillators; digital design techniques for IC; CMOS logic design, input-output circuits, latches and flip flops, counters, adders, decoders, muxes, dynamic gates. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 2250U.

ENGR 3240U Applications for Electromagnetics. Maxwell's equations and electromagnetic waves; waves in an unbounded medium; reflection, transmission, and refraction of waves at planar interfaces; parallel- plate and dielectric slab waveguides; cylindrical waveguides and cavity resonators, transmission lines; field-matter interactions and elementary antennas. 3 cr, 3 lec, 2 tut. Prerequisites: ENGR 2520U, ENGR 2530U.

ENGR 3250U Electric Machines. Three-phase circuits; magnetic circuits; electrical transformers; force and torque generation; asynchronous machines, induction machines, DCmachines; steady state characteristics of electric machines and variable speed drives; power electronics energy converters; generation, transmission, distribution, and utilization of electric power. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3240U.

ENGR 3260U Introduction to Energy Systems. Energy systems, resources and use; energy classifications and terminology; energy sources and currencies; energy supply and demand; energy conversion and utilization technologies; energy storage and distribution; energy use in countries and sectors of economies; energy intensity; global energy flows and utilization patterns; principal fuels; fuel science and technology: origins of fuels, classifications and physical and chemical properties of fuels, fuel handling and fire hazards, non-conventional fuels; sustainability, sustainable development and energy; clean energy systems. Environmental impact of energy systems such as power generation, industrial processes and transportation; air, soil and water pollution and their effects on the environment; generation mechanisms of chemical pollutants, photochemical pollutants and smog; Introduction to renewable energy resources (solar, wind, geothermal, biomass), photovoltaics, microturbines. Introduction to energy storage systems. Introduction to hydrogen and fuel cells. Introduction to life cycle assessment, industrial ecology, and key environmental tools. Application of energy and exergy analysis to energy systems. 3 cr, 3 lec. Prerequisites: ENGR 2320U or ENGR 2010U, or ENGR 2640U, ENVS 1000U.

ENGR 3270U Kinematics and Dynamics of

Machines. Classification of mechanisms; velocity, acceleration and force analyses; graphical and computer-oriented methods of analyses; balancing, flywheels, gears, gear trains, and cams. Introduction to Lagrangian dynamics; Lagrange's equations of motion; Hamilton's equations, and Hamilton's principle. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 2430U or ENGR 2020U.

ENGR 3280U Fundamentals of Computer-Aided Design Tools. Introduction to the concepts of computer-aided design (CAD) tools using a state-of-the-art CAD software package. Subjects include design process, parametric design, surface modeling, solid modeling, design assembly, documentation with computer- aided drawings, and dimensioning. The basics of finite element analysis (FEA), optimization, and rapid prototyping will also be introduced. 3 cr, 3 lec, 1 lab. Prerequisites: ENGR 3200U, MATH 1850U.

ENGR 3300U Integrated Manufacturing Systems. Facility layout; cellular manufacturing; fundamentals of automation; automatically- guided vehicles; flexible manufacturing; group technology; computer-aided process planning; forecasting; inventory management and control; production planning and control; production activity control systems. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 3030U, ENGR 3190U.

ENGR 3320U Fluid Power Systems. The course reviews relevant fluid mechanics principles and proceeds with treatments of individual components. Components analysed include: pumps, actuators, lines, valves and other related components. Discussions of individual components include: principles of operation, mathematical models, and design considerations. Analysis and design of fluid power systems used in industrial and processing equipment. Selected topics to include: positive displacement components, control devices, actuators, fluid transmission and system dynamics. 3 cr, 3 lec, 2 lab (biweekly). Prerequisites: ENGR 2860U, ENGR 3350U.

ENGR 3330U Circuit Design. The focus of this course is on electric and electronic circuit design. Frequency response, transfer function, feedback, oscillation and stability; low-pass, high-pass, and band-pass filters, quality factor and Bode plots; passive and active filters; circuit analysis and network synthesis; power electronic circuits: amplifiers and switches. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 2790U. Corequisite: ENGR 3390U.

ENGR 3350U Control Systems. Analysis and synthesis of linear feedback systems by classical and state space techniques. Nonlinear and optimal control systems. Modelling of dynamic systems; analysis of stability, transient and steady state characteristics of dynamic systems; characteristics of feedback systems; design of PID control laws using frequency response methods and the root locus technique. Introduction to nonlinear and optimal control systems. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 2790U, MATH 2860U.

ENGR 3360U Engineering Economics. Aspects of theoretical and applied economics relevant to engineers, including an introduction to fundamental principles of micro- and macroeconomics. Microeconomics topics include scarcity, opportunity cost, diminishing returns, elasticity, industrial organization, economies of scale and concentration. Macroeconomics topics include unemployment, inflation, economic growth, the multiplier, equilibrium, fiscal policy and monetary policy. The principle of money and banking are introduced along with the role of the Bank of Canada. Applied economics topics covered include cost concepts, time value of money, comparison of alternatives, depreciation, tax considerations, economic analysis of projects, break-even, sensitivity and risk, and decision models. Other topics covered include: economic decision analysis applied to private and public sector capital projects, discounted cash flow methods, lease analysis, replacement decisions, inflation impacts and public sector project analysis. 3 cr, 3 lec.

ENGR 3380U Strength of Materials. Principles of statics as applied to deformable solid bodies; stress and strain; Hooke's law, elastic behaviour of simple members under axial force, tension, compression, shear, torsion; bending and deflection of beams; design of beams, trusses, frames and shafts; column loads and buckling; impact loading; stability of structures. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 2220U, PHY 1010U.

ENGR 3390U Mechatronics. This course provides students with the tools required to design, model, analyse and control mechatronic systems; i.e. smart systems comprising electronic, mechanical, fluid and thermal components. The techniques for modelling various system components will be studied in a unified approach developing tools for the simulation of the performance of these systems. Analysis will also be made of the various components needed to design and control mechatronic systems including sensing, actuating, and I/O interfacing components. 3 cr, 3 lec, 2 lab, 1 tut. Prerequisites: ENGR 3270U, ENGR 3350U.

ENGR 3395U Manufacturing Systems Design. Concepts for successful product design relating to manufacturing processes. Principles of concurrent engineering, design for assembly, environmentally conscious design and manufacturing and the competitive aspects of manufacturing. Methods of assessment for engineering life cycles, manufacturing systems, assembly/disassembly processes in relation to rapid product manufacturing. Numerous case studies will be covered. Tutorial work will entail individual and group design for three to four projects. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering-management type and involve business and/or management factors. 3 cr, 3 lec, 2 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 3030U, ENGR 3190U, ENGR 3270U, ENGR 3350U, ENGR 3360U or BUSI 1700U, ENGR 3300U, ENGR 3390U, ENGR 3460U, ENGR 4045U.

ENGR 3410U Electromechanical Energy Conversion. This course provides an understanding of the principles of electromechanical energy conversion and introduces some common devices employed in the process. Specific topics covered include the principles of electromechanical energy conversion; ferromagnetic materials and their properties; basic operating concepts and steady state models for transformers, dc machines, and ac machines; electromechanical test and measurement procedures; characteristics and behaviour of machines. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 2790U, ENGR 2320U or ENGR 2640U.

ENGR 3420U Energy and Environmental Impact. Environmental impact of energy systems such as power generation, industrial processes and transportation. Air, soil and water pollution. Pollutants from power production and engines and their effects on the environment, generation mechanisms of chemical pollutants, photochemical pollutants and smog, fluid mechanics of jets, plumes, thermals and turbulent diffusion in the atmosphere. Design for environment methods, including pollution prevention techniques, life cycle assessment, pollution abatement devices and control methods, including exhaust gas treatment, absorption, filtration, scrubbers. Industrial ecology. Environmental legislation. Design of sustainable energy systems. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 3260U, ENVS 1000U.

ENGR 3450U Combustion and Engines. Combustion fundamentals, including flame stoichiometry, chemical kinetics, flame temperature, pre-mixed and diffusion flames. Applications to engineered combustion systems such as furnaces and fossil-fuelled engines. Continuous and unsteady combustion systems. Internal combustion engines, including cycles, fuels and lubricants, supercharging, carburetion, valving, manifolding, combustion chamber ignition and fuel injection; engine performance and testing. Design of combustors and engines. Methods for increasing combustion efficiency and reducing pollutant formation. Pollution reduction techniques. Safety issues. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: CHEM 1800U, ENGR 2320U, or ENGR 2640U.

ENGR 3460U Industrial Ergonomics. The biology of work; anatomical and physiological factors underlying the design of equipment and work places; biomechanical factors governing physical workload and motor performance; Circadian rhythms and shift work; measurement and specification of heat, light and sound levels with respect to the design of workplaces. Detailed analyses will be made of several cases in which human factors methods have been applied to improve the efficiency with which human/machine systems operate. 3 cr, 3 lec, 1 tut.

ENGR 3490U Microprocessor Systems Design. Basic structure of a computer; assembly-language and programming; interfacing and operating systems; machine language and step-

by-step instruction execution; bus interface and memory timing; parallel port elements and handshaking; serial ports; interrupt handling and flow from reset, state-of-the-art microprocessors: features and characteristics. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3140U.

ENGR 3530U Safety and Quality Management. Nuclear safety management: legal framework, regulatory environment, licensing process; safety culture; defence in depth; reliability concepts; investigating and reporting incidents; emergency procedures; quality assurance; total quality management: organizational structure, policies and procedures, interfaces, grading of QA processes, deficiencies and corrective actions, verification, competence of personnel, document control and records, ISO qualification process. 3 cr, 3 lec.

ENGR 3540U Nuclear Steam Supply Systems. Introduction to thermal and fast reactors and reactor cooling systems; natural and enriched fuels; pressure vessels and pressure tubes; reactor structures; moderator materials and systems; reactor coolant materials and systems; shutdown and safety systems, heat generation and removal in the fuel; modes of heat transfer from fuel to coolant; boiling heat transfer; cooling by natural circulation; measurement of thermal-hydraulic parameters; momentum, mass and energy transfer processes; requirements for main heat transport, shutdown cooling and emergency core cooling systems. 3 cr, 3 lec. Prerequisite: ENGR 2500U.

ENGR 3550U Nuclear Plant Steam Utilization Systems. Main design and operating features of nuclear power plant steam utilization systems using pressurized and boiling light water, pressurized heavy water and gas cooled reactors; steam utilization systems for small, medium and large reactors; unit control schemes; steam generator design and operating features, steam generator level and pressure control; turbine and generator operation; condenser and feedheating systems. 3 cr, 3 lec. Prerequisite: ENGR 3540U.

ENGR 3560U Radioactive Waste Management. Nature of radioactive waste; origin of low, intermediate and high activity waste; characteristics, forms and quantity of radioactive waste; production of radioactive waste at each stage of the nuclear cycle: mining, fuel fabrication, reactor operation and maintenance, spent fuel, reactor structural components; medical and industrial waste; handling, transporting, storing and disposing technologies for each type of waste; on-site and off-site storage; spent fuel reprocessing and disposal methods; radioactive waste management plans and practices in various countries; public concerns and perception of radioactive waste management. 3 cr, 3 lec. Prerequisite: ENGR 2500U.

ENGR 3570U Environmental Effects of Radiation. Topics include: natural and artificial environmental radiation; units and measurements; biological effects of radiation; maximum permissible public dose, magnitude and frequency; release of radioisotopes to the environment; dispersion in the atmosphere; dispersion in aquatic environment; food chain; calculation of total dose consequence; site demographic, meteorological, geologic, hydrologic and seismic characteristics; derived emission limits; radiation dose due to the nuclear fuel cycle; ALARA principle; emergency preparedness; on-site and off-site emergency procedures. 3 cr, 3 lec, 2 lab (biweekly). Prerequisite: ENGR 2950U or RADI 2100U, RADI 2110U.

ENGR 3650U Software Design III - Methodology and Emerging Topics in Design. Stages of the software lifecycle; development models such as waterfall, prototyping and incremental/iterative; structured vs. object-oriented methods. Maintenance and application of project management methodologies and team structure, metrics, and software tools in a modern development environment. Design patterns, rapid prototyping, V-Model. Extreme programming. Emerging topics: The last third of the course is dedicated to a discussion of new and emerging topics in the field. It is expected that this part of the course is updated on a yearly basis. 3 cr, 3 lec, 2 tut. Prerequisites: ENGR 2490U, ENGR 2720U.

ENGR 3700U Data Management Systems. Mass storage devices; principles of file systems; relational, object oriented, and object relational models, information retrieval. Structured query language, object oriented query language; accessing databases from modern programming languages; compression and handling of large data objects; management of database systems; data mining principles. Data representation with mark-up

languages, correctness and parsing. 3 cr, 3 lec, 2 tut. Prerequisites: ENGR 2720U, ENGR 3770U.

ENGR 3720U Software Design IV - Software Design and Artificial Intelligence. This course introduces students to basic concepts and methods of artificial intelligence from a software engineering perspective. Emphasis of the course will be on the selection of data representations and algorithms useful in the design and implementation of intelligent systems. Knowledge representation methods, state space search strategies, and use of logic for problem solving. Applications chosen from among expert systems, planning, natural language understanding, uncertainty reasoning, machine learning, and robotics. The course will contain an overview of one AI language and discussion of important applications of artificial intelligence methodology. 3 cr, 3 lec, 3 tut. Prerequisites: ENGR 3650U, ENGR 3770U.

ENGR 3730U Solar Energy Technologies. Incidence, absorption, reflection and re-radiation of sunlight; spectral characteristics and material properties for absorption and radiation of sunlight; fundamentals of photovoltaic generation, typical materials used in solar cells; design, operation and maintenance of photovoltaic systems; design of solar cells, current conversion and conditioning, storage and distribution of electricity in solar systems; concentrating solar systems; design and operation of solar hot water and space heating systems, including energy storage devices for these systems. 3 cr, 3 lec, 2 lab (biweekly). Prerequisite: ENGR 3260U.

ENGR 3740U Scientific Instrumentation. This course is designed to instruct students how to select, use and analyse the appropriate sensor technology (transducers) for measurements related to nuclear technology. In the course the student will learn how to perform experimental data analysis, how various components of sensing devices inter-relate (for example, relationships between amplifiers, transformers, filters, A/D, D/A etc), the operating principles of transducers for physical measurements, including, but not limited to: ionizing radiation, displacement and area, pressure, flow, temperature, force, torque, strain, motion, vibration, and air pollution. The student will learn both analog and digital techniques for data analysis, including multiplexing, data conversion and error detection and correction. The laboratory exercises will give the student hands-on experience designing measurement systems. Proper data reporting techniques will also be emphasized. 3 cr, 3 lec, 3 lab (biweekly), 1 tut. Prerequisites: ENGR 2790U, STAT 2800U.

ENGR 3770U Design and Analysis of Algorithms. Designing and analysing algorithms; asymptotic notation; recurrences and recursion; probabilistic analysis and randomized algorithms; sort algorithms; priority queues; medians and order statistics; data and advanced data structures; augmenting data structures for custom applications; dynamic programming; greedy algorithms; graph algorithms; sorting networks; matrix operations; linear programming; number theoretic algorithms; string matching; NP-completeness and approximation algorithms; object libraries. 3 cr, 3 lec, 2 tut. Prerequisites: ENGR 2110U, ENGR 2720U, MATH 1850U.

ENGR 3820U Nuclear Reactor Kinetics. An introduction to the basic principles of nuclear reactor kinetics and nuclear reactor control. Topics include: neutron cycle; reactor period; prompt and delayed neutrons; source neutron effects; sub-critical, critical and supercritical reactor; point reactor model; thermal power and neutron power; fission product poisoning; Xenon override capability; fresh and equilibrium fuel characteristics; reactivity effects of temperature changes and coolant voiding; reactivity control; approach to critical; reactor stability; spatial flux and power distribution. Reactor simulators will be used to illustrate the key principles being taught. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 2500U, MATH 2860U.

ENGR 3830U Wind Energy Systems. Availability and characteristics of wind energy; location of individual generators and wind farms; wind turbine designs for maximum range of wind speeds and electrical outputs; design of associated mechanical and electrical systems; characteristics of energy storage devices for wind energy systems; operation and maintenance of wind generators; design aspects to minimize environmental impact, construction and operating costs; wind turbine and system designs to meet the needs of the bulk electric system. 3 cr, 3 lec, 1 tut. Prerequisite: ENGR 2010U or ENGR 2320U or ENGR 2640U.

ENGR 3840U Fuel Cell Design. Principles and current state of fuel cell technologies; fuel cell thermodynamics; transport processes; electrochemistry; reliability and efficiency; fuel cell systems and areas of applications; design of various fuel cell types, including Phosphoric Acid Fuel Cells, Alkaline Fuel Cells, Proton Exchange Membrane, Molten Carbonate Fuel Cells, Solid Oxide Fuel Cells, Direct Methanol Fuel Cells. 3 cr, 3 lec, 2 lab (biweekly). Prerequisite: ENGR 2010U or ENGR 2320U or ENGR 2640U.

ENGR 3860U Introduction to Nuclear Reactor Technology. This course is designed to provide the radiation science student with a working background in nuclear reactor technology, so that they may be prepared to work in and around nuclear fission (or fusion) reactors. The emphasis of the course is on health physics and radiation protection aspects of the nuclear fuel cycle. Elementary reactor operation will be covered in sufficient detail to allow the student to have a working knowledge of where radiation hazards are produced, and what controls can be used to minimize the hazards. Nuclear reactor safety and control systems will be covered, and the inherent safety of the CANDU design will be described, and compared with other common designs such as PWR, BWR, RBMK etc. 3 cr, 3 lec, 2 tut (biweekly). Prerequisites: ENGR 2500U, PHY 1020U.

ENGR 3930U Heat Transfer. Introduction to conduction, convection and radiation. Solutions to steady-state and transient conduction problems. Heat conduction across contact surfaces and cylindrical walls. Heat generation in conduction. Solutions to convection problems for laminar and for turbulent flows. Forced and natural convection. Boiling and condensing heat transfer. Two phase flow in a channel. Critical heat flux. Heat exchangers, and heat exchanger effectiveness and operational characteristics. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 2320U or ENGR 2010U or ENGR 2640U.

ENGR 3950U Operating Systems. The organization and structure of modern operating systems and concurrent programming concepts. Context within which the operating system functions (hardware, other system programs, application programs, interactive users), internals and design issues, design trade-offs and decisions. Process description and control. Threads, SMP, microkernels. Concurrency: mutual exclusion and synchronization. Deadlocks and starvation. Memory management and virtual memory. Uniprocessor scheduling. Multiprocessor and real-time scheduling. I/O management and disk scheduling. File management. Introduction to distributed processing and client/server computing, distributed process management. Security, performance, and protection. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 1200U.

ENGR 3960U Programming Languages and Compilers. Modern operating systems: largescale distributed to small real-time operating systems; microcomputer/mainframe interconnections; message passing techniques; networks; distributed deadlocks and shared memory models; extended file systems and shared resources; grid computing and high-performance computing add-ons to operating systems; reliability and failover mechanisms, advanced topics in operating system management. 3 cr, 3 lec, 3 tut. Prerequisites: ENGR 2720U, ENGR 3770U.

ENGR 3980U Software Quality. Processes, methods and techniques for developing quality software, for assessing software quality, and for maintaining the quality of software. Software testing at the unit, module, subsystem and system levels, automatic and manual techniques for generating and validating test data, the testing process, static vs. dynamic analysis, functional testing, inspections and reliability assessment. Tradeoffs between software cost, schedule, time, and quality, integration of quality into the software development process as well as the principles of test planning and test execution. Process awareness, capability maturity. 3 cr, 3 lec, 2 tut. Prerequisites: ENGR 2490U, ENGR 3650U.

ENGR 4010U Vehicle Dynamics and Control. Total vehicle dynamics; dynamical properties of vehicle parts; the longitudinal, lateral and vertical dynamics; mathematical models of vehicles to predict their road performance; suppression of forces, moments, and movements under external road disturbances; steady-state handling and vehicle directional behaviour; transient response and stability in small disturbance maneuvers; nonlinear effects in tire modelling, classification and analysis of suspension systems; ride quality; driving stability; vehicle

control factors such as driver modelling, occupant comfort and driver interfaces; introduction to active suspension systems, traction control, and yaw-moment control; introduction to advanced vehicle control systems for intelligent vehicle-highway systems. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 3210U, ENGR 4260U.

ENGR 4015U Reliability and Maintenance. Introduction to life-cycle costing for equipment acquisition, operation, and replacement decision making; designing for reliability and determination of optimal maintenance and replacement policies for both capital equipment and components. Topics include: identification of an item's failure distribution and reliability function; reliability of series, parallel and redundant systems design configurations; time-to-repair and maintainability function; age and block replacement policies for components; the economic life model for capital equipment; provisioning of spare parts. 3 cr, 3 lec, 1 tut. Prerequisite: ENGR 4045U.

ENGR 4045U Quality Control. Quality improvement and productivity; quality costs, total quality management; statistical process control; control of incoming material, control charts for attribute and variable data, process capability. Process optimization and design of experiments; screening methods, fractional factorial experiments, Taguchi methods, empirical regression models; acceptance sampling. 3 cr, 3 lec, 1 tut. Prerequisite: STAT 2800U.

ENGR 4060U Automotive Structural Design and Materials Selection. The course covers the theory and design of automotive body structures and chassis systems in addition to the evaluation of such designs and material selection strategies. An emphasis is placed on the relationships between microstructures, processing, properties and design. The chassis dynamometer as a research and certification tool is introduced, as well as determination of load, road load testing, and power testing. Among other materials, reinforced fibre and cellular plastic composite materials are examined in order to identify their properties and applications. The fundamentals of crash mechanics, manufacturing methods, fabrication, assembly techniques, testing, repair, and design of composite products are also covered. Selected current automotive research and advances are examined. 3 cr, 3 lec, 1 tut. Prerequisite: ENGR 3000U.

ENGR 4080U Automotive Systems Design. The increasing complexity of automotive systems and the pressure to deliver these systems to market faster is driving the need for better engineering design approaches to product development. This course covers design theory, operation, and testing of systems found in modern automobiles, as well as the impact of automotive design on society. Students work in small groups of three or four and complete a series of projects in which they integrate efficient production methods, cost effectiveness, modern materials utilization, etc. Their work includes a comprehensive presentation of the latest systems and technologies and covers the fundamentals of design of passenger cars, trucks, etc.; layout of major vehicle subsystems to arrive at a preliminary vehicle design; use of systems engineering to define requirements, generate design concept and predict performance; design for vehicle safety. The "best" solutions are chosen from a group of solutions presented to them, based on specified criteria. Modelling and design validation is performed, in some instances, using a computational design and simulation environment. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering-management type and involve business and/or management factors. 3 cr, 3 lec, 2 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 3030U, ENGR 3190U, ENGR 3270U, ENGR 3350U, ENGR 4260U, ENGR 3000U, ENGR 3210U, ENGR 3220U, ENGR 3320U, ENGR 3360U or BUSI 1700U, ENGR 3450U.

ENGR 4100U Modern Control Systems. Mathematical models of systems: differential equations and linear approximations of physical systems; open- and closed-loop control systems: parameter variations, steady-state error, sensitivity analysis; performance of feedback control systems: time-domain performance specifications, transient response, and steady state error; stability analysis: Nyquist and Routh-Hurwitz criterion; frequency response methods; stability in the frequency domain; time-domain analysis of control systems. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3110U.

ENGR 4110U Power Systems. First, various means of electric power generation-through hydroelectric, thermoelectric, geothermal, wind, solar, and nuclear sources-are highlighted, and the choice of a given source-dictated by economic and environmental factors, application requirements and cost drivers-is discussed. Then the course focuses on electric power systems; mainly electric power generation transmission, distribution; planning and operating inter-connected power systems; operating strategies and economic dispatch; transmission power line parameters, transformer models, symmetrical components, power system modelling, power flow on transmission lines; power system fault analysis. 3 cr, 4 lec, 2 tut (biweekly). Prerequisite: ENGR 3250U.

ENGR 4160U Artificial Intelligence in Engineering. Introduction to artificial intelligence; knowledge-based systems, state space representation, search strategies, knowledge representation, reasoning with uncertainty; fuzzy sets, membership functions and operations, fuzzy relations, fuzzy reasoning; neural networks, basic neuron modelling, multi-layer perceptron, self-organization networks and adaptive theory; genetic algorithms for optimization and search; applications of artificial intelligence in engineering, design and manufacturing. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 3350U, MATH 2070U.

ENGR 4190U Multimedia Systems. Theory, features, design, performance, complexity analysis and application of multimedia engineering technologies; digital signal compression: audio, image, video, characterization, compression requirements; source entropy and hybrid coding, transform and wavelet-based coding; motion estimation; object-based processing, and multimedia indexing and retrieval. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3110U.

ENGR 4210U Advanced Solid Mechanics and Stress Analysis. Three-dimensional stress analysis; strain energy; energy methods; finite element method; asymmetric and curved beams, superposition of beam solutions, beams on elastic foundations; plate bending; buckling, including Euler's formulae for buckling; eccentric loading; fracture mechanics; fatigue. 3 cr, 4 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 2260U or ENGR 2420U.

ENGR 4220U Mechanical Systems Design. This course covers the science and morphology of design for a range of mechanical engineering devices, processes and systems, as well as the impact of design on society. Students work in small groups of three or four and complete a series of projects in which they integrate efficient production methods, cost effectiveness, modern materials utilization, etc. The "best" solutions are chosen from a group of solutions presented to them, based on specified criteria. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering-management type and involve business and/or management factors. 3 cr, 3 lec, 2 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 3030U, ENGR 3190U, ENGR 3270U, ENGR 3350U, ENGR 3210U, ENGR 3220U, ENGR 3360U or BUSI 1700U, ENGR 3390U, ENGR 3930U.

ENGR 4230U Thermofluids and Energy Systems Design. This course covers the science and morphology of design as applied to thermal, fluids and energy processes and systems. Students work in small groups of three or four and complete a series of projects in which they integrate the principles of fluid mechanics, thermodynamics and heat transfer into designs. Design criteria include energy efficiency, environmental impact, economics, etc. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering-management type and involve business and/or management factors. 3 cr, 3 lec, 2 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 3030U, ENGR 3190U, ENGR 3260U, ENGR 3350U, ENGR 3320U, ENGR 3360U or BUSI 1700U, ENGR 3450U ENGR 3930U, ENGR 4240U.

ENGR 4240U Applied Thermal and Fluids Engineering. This course incorporates the fundamental principles of thermodynamics and fluid mechanics to engineering applications. Topics covered include refrigeration; heating, ventilating and air conditioning; heat engine cycles, including the Rankine cycle; combustion; pipe networks; flow transients, including water hammer; open channel and free surface flows; flow machines including pumps,

turbines and propellers. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 2320U, or ENGR 2640U, ENGR 2860U.

ENGR 4250U Advanced Materials Engineering. Methodology of materials selection; evaluation of property data; materials testing; tensile properties, hardness, impact properties, fatigue, creep; failure and modes of fracture; interrelationships of structure, properties and processing; structural modifications in metals, ceramics and composite materials; strengthening mechanisms; heat treatment; processing and applications of engineering materials; introduction to electron microscopy, x-ray diffraction, and mass spectrometry. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 2220U, ENGR 2260U or ENGR 2420U.

ENGR 4260U Automotive Engineering. Technical systems and related engineering aspects of vehicles are covered with a focus on how they pertain to vehicle design, analysis, and performance development. Topics covered include: engine design for robustness, performance and emissions compliance. Layout of the powertrain, engine torque and the influence of traction on driveability are discussed. Mechanics and properties of road-tires of the camber and caster, cornering, steady-state handling as they relate to suspension and steering design, ride comfort, handling and performance objectives are studied. Static and dynamic weight transfer, accelerating and braking, rolling resistance, aerodynamic influence, vehicle road load, and the proving ground testing of vehicles are covered. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 2430U or ENGR 2020U, ENGR 3350U.

ENGR 4280U Robotics and Automation. Industrial robots; robot kinematics, differential kinematics; statics, dynamics and control of robot arms; non-contact and contact sensors; actuators; real-time joint control; task planning and programming of industrial robots; applications of robots. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 3390U.

ENGR 4310U Electronics. The focus of this course is the analysis and design of electronic circuits. Semiconductors, fundamental characteristics, modes of operation, and types of diodes, bipolar junction transistors, field-effect transistors; non-linear circuit applications: small signals and rectifiers; transistor biasing and amplifiers; integrated circuits: fabrication and characteristics. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 3330U, ENGR 3390U.

ENGR 4320U Advanced Mechatronics. The focus of this course is to provide the tools required to design, model, analyse and control mechatronics systems. Modelling of various system components into a unified approach and tools for the simulation of the performance of these systems; characteristics of typical mechatronics systems in terms of their impacts on enhancement of performance, speed of operation, and physical size; applications of mechatronics to robotics and automation industry, and other intelligent systems. 3 cr, 4 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 3330U, ENGR 3390U.

ENGR 4330U Mechatronic Systems Design. This course covers design considerations for systems that incorporate mechatronic components. Topics covered include the principles of mechatronic control, including single and two degree of freedom systems; linear feedback; disturbance rejection; state estimation, and filtering. Students work in small groups of three or four and complete a series of projects in which they integrate efficient production methods, cost effectiveness, modern materials utilization, etc. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering-management type and involve business and/or management factors. 3 cr, 3 lec, 2 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 3030U, ENGR 3190U, ENGR 3270U, ENGR 3350U, ENGR 3320U, ENGR 3330U, ENGR 3360U or BUSI 1700U, ENGR 3390U.

ENGR 4350U Microprocessors. Number systems, architecture, instructions, and subroutines; algorithms; memory; PIA; interrupts and timers; transistors; binary interfaces; conversion of A/D and D/A; stepper motors; dc motors; z-transform; breadboard integration; steady state analysis and component ratings; control loop design and control loop modelling. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisites: ENGR 3350U, ENGR 3390U.

ENGR 4360U Nuclear Plant Electric and Auxiliary Systems. Nuclear plant unit electrical distribution systems, plant emergency electric power systems; condenser cooling systems; water and air cooling systems; low-

pressure, high-pressure and recirculating service water systems; demineralized water systems; heavy water management and upgrading; instrument and breathing air systems; other auxiliary plant systems. 3 cr, 3 lec. Prerequisite: ENGR 3550U.

ENGR 4370U Nuclear Plant Safety. Worker and public safety requirements; codes and standards; sources of radioactive release; defence in depth; principle of control, cool, contain; accident prevention, mitigation and accommodation; separation and independence; redundancy; common mode events; inherent safety features; plant safety systems; safety culture, management of plant safety; design basis accident; accident analysis; examples of nuclear accidents. 3 cr, 3 lec, 2 tut (biweekly). Prerequisite: ENGR 4640U.

ENGR 4380U Life Cycle Engineering. The course introduces the fundamentals of both product and process engineering with an emphasis on life cycle models. A mixture of practical and theoretical topics, methodologies, principles, and techniques of life-cycle engineering are covered such as design reviews, re-engineering, mass customization, product modularity, cost/benefit analysis, value engineering, and life-cycle design [e.g., Design for Assembly (DFA), Design for Manufacturing (DFM), Design for Serviceability (DFS), Reliability design etc.]. Students develop an understanding of the performance, cost, and environmental implications of both product design and manufacture and become capable of translating these into engineering "cradle-to-grave" responsibility requirements, goals, and specifications in order to maximize the values of products and the effectiveness of supply chain management while containing the costs to the manufacturer, the user, and society. Energy utilization is considered throughout along with energy-related life cycle methods. 3 cr, 3 lec, 1 tut (biweekly). Prerequisite: ENGR 2310U.

ENGR 4390U Modelling Manufacturing Systems. Queuing theory; production scheduling; modelling of production systems; discrete event simulation languages and programming; discrete event simulation software for manufacturing; production process scheduling; capacity planning; analytic rapid modelling; facility simulation. 3 cr, 4 lec, 2 lab. Prerequisite: ENGR 3300U.

ENGR 4410U Fossil Fuel Energy Conversion. Electrical systems loads, peaks, reliability. Types of fossil fuelled power plants. Complex Rankine and Brayton cycles. Combined-cycle power plants. Cogeneration and trigeneration. Efficiencies, irreversibilities and losses. Steam supply systems: coal firing systems; steam generator types; steam plant efficiencies; heat transfer and thermal transport in fossil fuel fired steam generators. Steam turbines: impulse and reaction blading; mechanical design of turbine components and operational considerations; efficiencies. Gas turbines: gas path design; heat balance and efficiency determination; performance analysis of actual power plant turbines; design aspects. Fans, centrifugal and axial-flow compressors, and their design. Auxiliary power plant equipment: heat exchangers, fuel preparation, water treatment, cooling equipment. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 3260U.

ENGR 4420U DSP Theory and Design. Sampling and quantization of low-pass and bandpass, deterministic and random signals; discrete Fourier transform and fast Fourier transform; design and realization of digital filters: FIR and IIR; DSP hardware: I/O methods, finite word-length arithmetic and noise; DSP applications in communications, multimedia, and engineering. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3110U.

ENGR 4430U Sustainable and Alternative Energy Technologies. Descriptions of systems and design issues and parameters, including performance, operating characteristics, reliability. Small-scale hydraulic energy. Tidal and wave energy. Solar energy systems, including photovoltaics and thermal systems. Wind energy systems. Biomass energy. District energy. Hydrogen energy systems, including production, storage, transport and utilization technologies. Fuel cells: fundamentals such as fuel cell thermodynamics, electrode kinetics; and types, including proton exchange membrane and solid oxide fuel cells. Energy storage, including thermal, compressed air and battery storage. Geothermal energy systems. Magnetohydrodynamics, thermoelectrics, thermionics. Future directions. 3 cr, 3 lec, 2 lab (biweekly). Prerequisite: ENGR 4240U.

ENGR 4440U Advanced Power Generation. Fundamental and applied aspects of nuclear engineering: structure of the nucleus; nuclear

stability and radioactive decay; interaction of radiation with matter including radiological health hazards; interaction of neutrons including cross-sections, flux, moderation, fission, neutron diffusion and criticality; engineering of nuclear reactors; reactor start-up, shut down and refueling; reactor systems including CANDU and U.S. reactors, and gas-cooled and breeder reactors; reactor accidents, fuel cycles and waste disposal. Fusion. Hydroelectric power generation: turbines and other components, water reservoirs, pumped energy storage. Aircraft gas turbine engines, including turbojets and turbofans; intakes, nozzles; aero-derivative gas turbines for terrestrial applications. 3 cr, 4 lec, 1 tut. Prerequisite: ENGR 4240U.

ENGR 4450U Thermal Environmental Engineering. Heating, ventilating, air conditioning and refrigeration. Psychrometrics and psychrometric processes. Sensible heating and cooling, cooling and dehumidification, mixing and humidification. Ventilation and room air distribution. Human comfort. Indoor air quality. Refrigeration and refrigeration systems. Design of air conditioning and heating systems. Equipment selection. Duct and fan design. Pump and piping design. Energy management in buildings. 3 cr, 3 lec, 2 lab (biweekly), 1 tut. Prerequisite: ENGR 4240U.

ENGR 4460U Nuclear Power Systems. Principles of fission; nuclear fuels; thermal and fast reactors; converters and breeders; light water reactors; heavy water reactors, gas cooled reactors; direct and indirect cycle nuclear plants; unit control strategies; nuclear plant safety; fuel cycles; plant decommissioning; waste management; environmental effects; life-cycle costs. Principles of fusion reactors; experimental fusion facilities. 3 cr, 3 lec. Prerequisite: PHY 1020U.

ENGR 4470U Hydrogen Power Systems. Potential benefits of the hydrogen economy; hydrogen production by reforming and by electrolysis; storage methods, including compressed gas, liquid hydrogen, metal hydride, graphite, iron sponge; minimizing combustion and explosion hazards; applications in transportation, small and large scale stationary power applications; integrated energy systems using hydrogen as the key energy carrier. 3 cr, 3 lec. Prerequisite: ENGR 3840U.

ENGR 4480U Emerging Energy Systems. This course will examine recent advances in energy systems, including fossil, nuclear, solar, wind, biomass, municipal waste, geothermal, tidal and wave energy; new energy sources, methods of conversion, transportation, storage and disposal will be examined from a systems point of view, and include environmental, economic and political aspects; feasibility of new technologies and significant advances in existing technologies will be examined. 3 cr, 3 lec. Prerequisite: ENGR 3260U.

ENGR 4500U Wireless Communications. Digital wireless phones, cordless phones, and wireless data; digital cellular mobile standards: 2G, 2.5G, 3G, 4G; FDMA/ TDMA/ CDMA; OFDM; cellular traffic and layout; slow and fast fading; Doppler shift, co-channel and adjacent channel interferences; countermeasures for mobile channel impairments; call-processing; hand-off process. 3 cr, 3 lec. Prerequisite: ENGR 3130U.

ENGR 4510U Nuclear Plant Chemistry (formerly ENGR 3510U). Corrosion and crud formation; heavy water chemistry; heavy water production and up-keep; moderator and heat transport system chemistry; purification systems to remove particulates, contaminants and chemicals added to control reactivity; decontamination; steam generator, condenser and feedwater chemistry; pH and pD control in power plants; online and offline control of process chemistry; metallurgical problems in nuclear power plants; metallurgical techniques for irradiated materials. 3 cr, 3 lec. Prerequisite: CHEM 1800U; or CHEM 1020U. Note: Elective for nuclear engineering programs.

ENGR 4520U Nuclear Plant Safety Design. This course describes the regulatory requirements and the principles guiding the protection of workers and the general public from being harmed as a result of nuclear plant operations. Topics include: worker and public safety requirements; codes and standards; sources of radioactive release; defence in depth; principle of control, cool, contain; accident prevention, mitigation and accommodation; separation and independence; redundancy; common mode events; inherent safety features; plant safety systems; safety culture, management of plant safety; design basis accident; accident analysis; quantitative and probabilistic risk assessment; exam-

ples of nuclear accidents; online and off-line computer codes for the design and safety analysis of nuclear plants. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 4640U, ENGR 4660U, ENGR 4700U.

ENGR 4530U Hydroelectric Power Systems. Principles of hydroelectric energy conversion; design of dams and reservoirs; run-of-river plants; design of hydroelectric turbine-generators; AC and DC generators; mini- and micro-hydro generators; operating and maintenance aspects; special uses as spinning reserves and for frequency control of the bulk electric system; pumped-storage; environmental impacts. 3 cr, 3 lec. Prerequisites: ENGR 2360U, ENGR 3260U.

ENGR 4540U Energy Efficiency, Management and Simulation. Exergy analysis and other second- law analysis methodologies: theoretical foundations, exergy efficiencies and losses, applications to devices and systems; use in efficiency improvement and design. Energy management: energy control and usage strategies, energy economics, energy audits, energy conservation strategies, design for energy improved management. Simulation and computational methods for energy and thermofluids systems: Conservation and energy equations; finite difference and element methods; one- and two-dimensional steady and unsteady problems; computational fluid dynamics; use of simulation in energy systems design. 3 cr, 3 lec, 1 tut. Prerequisite: ENGR 4240U.

ENGR 4550U Thesis Project I. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project topic will be selected to include some aspects of the student's specialization. Students will be required to organize and conduct a project with a significant analytical component, including consideration of technical, economic, environmental and other societal impacts. Thesis Project I will typically be a group project, but with each student having clearly defined roles, objectives and outcomes. The requirements include a written paper and a group presentation of the project outcomes. 3 cr, 1 lec, 4 lab, 1 tut. Prerequisite: Professor's permission.

ENGR 4560U Thesis Project II. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project topic will be selected to include some aspects of the student's specialization. Students will be required to organize and conduct a project with a significant analytical component, including consideration of technical, economic, environmental and other societal impacts. Thesis Project II will typically be an individual research or design project, although with the approval of the professor, a significant and clearly delineated individual contribution to a group project is acceptable. The requirements include a written paper and an individual presentation of the project outcomes. 3 cr, 6 lab. Prerequisite: ENGR 4550U.

ENGR 4610U Corrosion for Engineers (formerly ENGR 3610U). A study of types, causes, costs, measurement and prevention of corrosion. Topics include: effects of material choices and the environment; types of corrosion discussed: general or uniform, galvanic, crevice, pitting, intergranular, selective leaching, stress-corrosion, erosion-corrosion, hydrogen effects; corrosion testing; selection of materials; aqueous corrosion; high temperature corrosion; corrosion in nuclear and fossil plants and other industrial environments; electrochemical principles; thermodynamics; electrode kinetics; aqueous corrosion kinetics; practical applications. 3 cr, 3 lec. Prerequisite: CHEM 1020U or CHEM 1800U

ENGR 4620U Radioactive Waste Management Design (formerly ENGR 3640U). Students will study: nature of radioactive waste; origin of low, intermediate and high activity waste; characteristics, forms and quantity of radioactive waste; production of radioactive waste at each stage of the nuclear cycle: mining, fuel fabrication, reactor operation and maintenance, spent fuel, reactor structural components; medical and industrial waste; handling, transporting, storing and disposing technologies for each type of waste; on-site and offsite storage; spent fuel reprocessing and disposal methods; radioactive waste management plans and practices in various countries; public concerns and perception of radioactive waste management. Two field trips will be arranged. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 3570U, ENGR 3930U, ENGR 4610U.

ENGR 4640U Nuclear Plant Operation. A combination of lectures and self-paced interactive CD-ROM study will introduce students to the principles of energy conversion, to the operating features of the main nuclear reactor types, the use of pressure vessels and pressure tubes, natural versus enriched fuel, moderators, reactor coolant systems, steam turbines and associated water systems, generators, transformers, electrical output and plant electrical systems, grid frequency and voltage control, reactor-following-turbine and turbine-following- reactor unit control systems, turbinegenerator governing, power maneuvering capability, trips, steam dumping to the condenser, normal and abnormal operating events. 3 cr, 3 lec, 1 tut. Prerequisite: PHY 1020U.

ENGR 4650U Computer Networks. Network history and architectures; reference Model for Open systems Interconnection (OSI): descriptions, examples, and applications; bridges, routers, gateways; routing, multicast deliver; TCP/IP protocol suite; transmission media (wired and wireless), network topologies (ring, bus, tree, star, mesh); local area networks, Ethernet, Token passing, wireless LAN, personal LAN, WAN; communication network management; ATM and BISDN, the Internet: from services to security. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisite: ENGR 3140U.

ENGR 4660U Risk Analysis Methods. Students will apply probability theory to discrete and continuous events. Topics include: random variables; decision theory, including Bayes' Theorem, the likelihood principle, prior posterior and predictive distributions, survival models. Students will also study chemical, physical, biological hazards; recognition, evaluation, prevention and control of hazards; industrial hygiene and occupational health; analysis, assessment, characterization and communication of risks. 3 cr, 3 lec, 1 tut. Prerequisite: STAT 2800U.

ENGR 4670U Shielding Design (formerly ENGR 3670U). Radiation sources; characteristics and utilization of various radiation detectors; statistics of radiation counting; radiation spectroscopy with scintillation detector; semi-conductor detectors; identification and measurement of source strength, spectrum and geometry; shielding requirements for various types of radiation; shielding materials for equipment and processes employing radiation; radiation heating; radiation damage; measuring the effectiveness of various shielding materials; shielding for the transportation of radioactive materials; calculation and design of shielding for industrial and power plant applications; shielding requirements for spent fuel storage. 3 cr, 3 lec, 2 lab. Prerequisite: ENGR 2950U; or RADI 2100U, RADI 2110U. Note: Elective for nuclear engineering or radiation science programs.

ENGR 4680U Nuclear Materials (formerly ENGR 3920U). Irradiation effects on material properties, including neutrons, charged particles and gamma radiation; activation products; selection of materials for nuclear applications; radiation induced damage in materials; neutronic, thermal and structural considerations; material properties of nuclear fuels and fuel cladding; pressure vessel and pressure tube material behaviour; moderator, coolant and steam generator material properties; materials suitable for reactivity control device and shielding; materials used for long term storage of radioactive waste and spent fuel; activation analysis of materials using a neutron source. 3 cr, 3 lec. Prerequisites: ENGR 2950U, ENGR 2220U. Note: Elective for nuclear engineering or radiation science programs.

ENGR 4700U Nuclear Plant Design and Simulation. Introduces the main design and operating features of nuclear power plants using pressurized and boiling light water, pressurized heavy water and gas cooled reactors; small, medium and large reactors; unit control schemes; shutdown and safety systems; reactor cooling, shutdown and emergency core cooling systems; steam generator design features, level and pressure control; turbine and generator design; feedwater systems; unit electrical, service water and air systems. Where appropriate, nuclear power plant simulators will be used to demonstrate key aspects of power plant design. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 2010U, ENGR 4780U, ENGR 4640U.

ENGR 4730U Reactor Control. The time and frequency domain performance characterizations of control loops are introduced with consideration of actuator and sensor limitations. Different controller design and tuning methods and instrumentation calibration procedures are discussed. Advanced control technologies, such as distributed control systems

are introduced in view of their potential applications in the existing and newly constructed CANDU power plants. Students gain familiarity with the use of indicators and alarms; the role of the operator, man-machine interface design; the use of computers in reactor control; in-core and out-of-core measurement of neutron flux, spatial flux control, start-up instrumentation, failed fuel detection and location; reactivity control methods, mechanisms and algorithms; reactor shutdown methods, mechanisms and systems; loss of reactor control; heat transport system pressure and inventory control. 3 cr, 3 lec. Prerequisite: MATH 2860U. Corequisite: ENGR 3740U.

ENGR 4750U Microwave and RF Circuits. Signal integrity in high-speed digital circuits; wave equation, ideal transmission circuits; transient on transmission lines; planar transmission lines and introduction to MMIC's; design with scattering parameters; planar power dividers; directional couplers; microwave filters; solid-state microwave amplifiers, noise, diode mixers; RF receiver chains, oscillators. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisites: ENGR 3130U, ENGR 3230U.

ENGR 4760U Ethics, Law and Professionalism for Engineers. Legal aspects of engineering practice; business organizations and corporations; intellectual and industrial property; conflict resolution; tort liability and contract law; employment and labour law; public safety and health considerations; occupational health and safety and WHMIS; Canadian and international engineering standards and commercial practices; international trade; environmental laws and regulations; environmental stewardship and sustainable development; corporate social responsibility; equity. Ethics and moral philosophy; applied ethics; ethical aspects of engineering practice; engineering codes of ethics and ethical obligations of engineers; detecting ethical dilemmas and methods for resolving them; research ethics. The engineering profession and its history; engineering associations and societies; engineering licensure; the role and responsibilities of the professional engineer in society; engineers in industry, management and private practice. 3 cr, 3 lec.

ENGR 4780U Nuclear Reactor Design (formerly ENGR 3780U). An introduction to thermal and fast reactors and reactor cooling systems. Topics include: natural and enriched fuels; pressure vessels and pressure tubes; reactor structures; moderator materials and systems; reactor coolant materials and systems; shutdown and safety systems, heat generation and removal in the fuel; modes of heat transfer from fuel to coolant; boiling heat transfer; cooling by natural circulation; measurement of thermal-hydraulic parameters; momentum, mass and energy transfer processes; requirements for main heat transport, shutdown cooling and emergency core cooling systems. Nuclear power plant simulators will be used to demonstrate key aspects of reactor design. 3 cr, 3 lec, 1 tut. Prerequisites: ENGR 2500U, ENGR 2860U, ENGR 3820U, ENGR 3930U, MATH 2070U or MATH 2810U.

ENGR 4790U Distributed Systems. Distributed operating systems and applications issues, emphasizing high-level protocols and distributed state sharing as the key technologies. Topics: distributed shared memory, object-oriented distributed system design, ontologies, distributed directory services, global namespace systems atomic transactions and time synchronization, file access, process scheduling, process migration and remote procedure call focusing on distribution, scale, robustness in the face of failure, distributed security and authentication protocols. Multi-Agent Systems and Distributed Artificial Intelligence. Industrial and emerging standards for distributed systems. 3 cr, 3 lec, 2 tut, 3 lab (biweekly). Prerequisites: ENGR 2110U, ENGR 3770U, ENGR 3950U.

ENGR 4800U Advanced Operating Systems. Modern operating systems: large-scale distributed to small real-time operating systems; microcomputer/mainframe interconnections; message passing techniques; networks; distributed deadlocks and shared memory models; extended file systems and shared resources; grid computing and high-performance computing add-ons to operating systems; reliability and failover mechanisms, advanced topics in operating system management. 3 cr, 3 lec, 2 tut, 3 lab (biweekly). Prerequisite: ENGR 3950U.

ENGR 4810U Nuclear Fuel Cycles. Students study the production of fissile and fertile nuclear fuel; isotope separation; enrichment of uranium; characteristics of fuel-element materials; metal and ceramic uranium fuel;

design and fabrication of fuel-elements; fuelling strategies; fuel failure mechanisms and detection of failed fuel; properties of irradiated fuel; the role of plutonium; principles of spent fuel reprocessing; dissolution of spent fuel from nuclear reactors; plutonium separation; meeting safe-guards requirements; natural versus slightly enriched fuel cycles; recycling of PWR fuel in CANDU; use of plutonium from the weapons program; thermal breeders; fast breeders. 3 cr, 3 lec. Prerequisites: ENGR 4610U, ENGR 4780U.

ENGR 4830U Real Time Systems and Control. Computing systems design for real-time applications in control, embedded systems and communications; microcontrollers; data acquisition in robotics and manufacturing, interactive and multimedia applications; file management, memory management and multitasking in a real-time environment; object-oriented design principles for real-time systems. Robustness; bus and interface systems; Distributed computing systems; synchronization, fault tolerance. Industrial standards. 3 cr, 3 lec, 2 tut, 3 lab (biweekly). Prerequisite: ENGR 3950U.

ENGR 4840U Software and Computer Security. Introduction to software security, managing software security risk, selecting technologies open vs. closed source, principles of software security, auditing software, buffer overflows, access control, authorization and authentication, race conditions, randomness and determinism, applying cryptography, trust management and input validation, law and ethics of IT security, security at the operating system and network level. Firewalls, intrusion detection. 3 cr, 3 lec. Prerequisites: ENGR 4650U, ENGR 4790U.

ENGR 4850U User Interfaces. Principles of human interaction with computers, Graphical User Interfaces (Windows, Unix), concrete designs and good design principles. Rapid prototyping, evaluation methods for user interfaces, cognitive psychology. Ergonomics, principles of computer graphics, voice recognition, remote instrumentation, immersive environments, virtual reality, augmented reality. 3 cr, 3 lec, 2 tut. Prerequisite: ENGR 3650U.

ENGR 4860U Computer Graphics Design. The basic concepts, tools and techniques of computer graphics are described, and the fundamental transformations of scaling, translation, rotation, windowing, hidden line removal, image processing and clipping are presented. Mathematical tools needed for the geometrical aspects of computer graphics are discussed. Particular emphasis will be placed on new developments in microcomputer graphics. Students will be expected to develop a graphics application in C++ and/or JAVA in conjunction with available graphics libraries. 3 cr, 3 lec, 3 lab (biweekly), 2 tut. Prerequisites: ENGR 2110U, ENGR 2710U.

ENGR 4880U Principles of Fusion Energy. This course explores the nature and energy generating potential of fusion reactions. Topics include: matter-energy transformations; fusion reaction analysis; Coulomb repulsion; deuterium-tritium reactions; production, extraction and storage of tritium; energy efficiency; fusion fuels and wastes; fusion reactor blankets; burn cycles; characteristics and diagnostics of plasmas; magnetic and inertial confinement schemes for fusion; tokomak techniques; laser fusion techniques; damage to walls and other materials; fission-fusion reactions; ITER Project; global fusion research projects. 3 cr, 3 lec. Prerequisites: ENGR 2500U, ENGR 3930U.

ENGR 4890U Advanced Computer Networks. Advanced topics in computer networks with a particular emphasis on protocols used throughout the Internet. The course strengthens the student's understanding of fundamental concepts, requirements, and design tradeoffs, particularly as related to scheduling, congestion control, advanced routing protocols, traffic management, wireless access and mobility, and applications. More importantly, the course discusses how networking may evolve in the future to provide ubiquitous support for quality-of-service (QoS) in heterogeneous environments. 3 cr, 3 lec, 2 tut, 3 lab (biweekly). Prerequisite: ENGR 4650U.

ENGR 4900U Software Engineering Systems Design. This course will cover the science of design and the morphology of design as well as the impact of design on society. Students will work in small groups of 3 or 4 and they will complete a series of projects in which they will be expected to integrate efficient production methods, cost effectiveness and modern materials utilization. The "best" solution will be chosen from a group of solutions presented to them, based on specified criteria. A special requirement for students in

engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering- management type and involve business and/or management factors. 3 cr, 3 lec, 1 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 3140U, ENGR 3650U, ENGR 3770U, ENGR 3950U, ENGR 3360U or BUSI 1700U, ENGR 3700U, ENGR 3720U, ENGR 3960U, ENGR 3980U. Successful completion of all non-elective courses in year three.

ENGR 4920U Electrical Engineering Systems Design. This course provides students with the opportunity for hands-on experience. Students work in teams to formulate the problem, propose an engineering solution or a design in the presence of technical and socio-economic constraints, and make sound professional judgments among alternative solutions. This course is intended to enhance the student's repertoire of professional problem-solving and engineering design skills in the context of realistic engineering situations. This course provides the student with the opportunity to pull together and apply ideas and concepts learned throughout the curriculum-in the areas of communications, electronics, power and computers-through projects. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, some of the design projects must be of an engineering-management type and involve business and/or management factors. 3 cr, 3 lec, 1 tut. Prerequisite: Successful completion of all non-elective courses in year three, i.e., ENGR 2640U, ENGR 3110U, ENGR 3140U, ENGR 3240U, ENGR 3070U, ENGR 3130U, ENGR 3230U, ENGR 3250U, ENGR 3360U or BUSI 1700U, ENGR 3490U. Successful completion of all nonelective courses in year three.

ENGR 4930U Optical Communications. Optical technology and applications; basic characteristics of optical fibres and associated system components; design considerations for optical fibre links and multi-stage service requirements; engineering applications of optical devices. 3 cr, 3 lec. Prerequisite: ENGR 3240U.

ENGR 4994U Thesis Design Project I. The thesis design project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project topic will be selected to include some aspects of the student's specialization. Students will be required to organize and conduct of a design project with a significant analytical component, including consideration of technical, economic, environmental and other societal impacts. Thesis Design Project I will typically be a group design project, but with each student having clearly defined roles, objectives and outcomes. The requirements include a written paper and a group presentation of the project outcomes. 3 cr, 1 lec, 4 lab, 1 tut. Prerequisite: Dean or dean's designates' permission. Students must have completed all courses up to and including third year and be in clear standing.

ENGR 4998U Thesis Design Project II. The thesis design project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project topic will be selected to include some aspects of the student's specialization. Students will be required to organize and conduct of a design project with a significant analytical and/or experimental component, including consideration of technical, economic, environmental and other societal impacts. Thesis Design Project II will typically be an individual design project, although with the approval of the professor, a significant and clearly delineated individual contribution to a group design project is acceptable. The requirements include a written paper and an individual presentation of the project outcomes. 3 cr, 6 lab. Prerequisite:. ENGR 4994U and dean or dean's designates' permission.

ENGR 4999U Design Thesis. An engineering thesis project relating to design, on a topic relevant to the student's program, will be carried out under the supervision of a faculty advisor. The course stresses independent work skills and the synthesis of knowledge acquired from previously studied courses. A wide range of design-related topics may be covered, including research and development, testing and/or evaluation of a system, process or device. Each student will prepare

a formal technical report and will make an oral presentation. A special requirement for students in engineering and management programs is that, because of the dual orientation of such programs, the thesis topic be selected so as to allow the student to investigate, integrate and apply engineering and management principles, objectives and practices as a component of the design thesis. 3 cr, 6 tut. Prerequisite: Successful completion of all third year non-elective courses. ENGR 3395U or ENGR 4220U or ENGR 4330U or ENGR 4230U or ENGR 4080U or ENGR 4920U or ENGR 4900U.

ENVS 1000U Environmental Science. This course will introduce the conceptual, interdisciplinary framework of environmental science by examining its physical, biological, economic and social components. Topics will include environmental problems and scientific principles; ecological principles (ecosystems, nutrient cycles, geographic ecology, climate and biodiversity); resources and sustainability (food, water, energy and minerals); climate change; pollution (indoor and outdoor air, water, effects on health and ecosystems); energy (renewable, non-renewable, management); agriculture and food production (pesticides and pest control, energy and chemical inputs, land, soil water resources, population and economic issues); waste management and remediation and prevention of environmental degradation. Canadian examples will be used wherever possible but the underlying theme will include a more global approach. 3 cr, 3 lec, 2 tut.

ENVS 2010U Introductory Environment Science. This course will introduce the scientific framework associated with the Earth's environment system. Topics include Earth's energy budget, structure and circulation of the atmosphere and oceans, hydrologic cycle, mass budget, cloud formation, precipitation, and surface run-off. Particular attention will be focused on the science of important environmental issues including climate change, ozone layer depletion, pollutant transport, impact of mercury, PCB and other contaminates, and land-use influence on precipitation run-off and flooding. Whenever possible, case studies of actual environmental problems will be used to highlight the importance of the scientific issues. 3 cr, 3 lec, 2 tut. Prerequisites: CHEM 1020U or CHEM1800U, PHY 1020U or PHY 1040U.

ENVS 3020U Introductory Energy Science. This course introduces the basic sources of energy available on Earth, the primary uses and economic aspects of energy, and the means by which energy is delivered from source to use. The main sources of energy available to our civilization will be examined: expendable sources - fossil fuels, nuclear fuels for fission and fusion; renewable sources - radiation from the sun, geothermal, wind, wave and tidal energies, biomass. The earth's energy balance and radiative losses will be described. The principal uses of energy in industrial production, transportation, communication, heating, cooling, illumination, and entertainment will be examined. Energy delivery through conventional liquid and gaseous fuels, electricity and novel systems such as hydrogen and fuel cells will be described. The economic aspects of energy utilization will be discussed. 3 cr, 3 lec. Prerequisites: CHEM 1020U, PHY 1020U, CHEM 2040U, PHY 2050U or ENGR 2640U.

ENVS 3110U Economics and Politics of the Environment. This course provides an overview of the social aspects of energy and the environment, with particular focus on economic, political, and management dimensions. The course will emphasize practical applications of theory to contemporary issues. Examples and discussion in the course will focus on matters of energy and the environment. 3 cr, 3 lec, 1 tut. Prerequisites: ENVS 2010U, ENVS 3020U.

FSCI 1010U Introductory Forensic Science. This course introduces forensic science to students with no prior knowledge of the subject. The course is coordinated by the professor but taught predominantly by guest speakers from the police and forensic community. A range of topics are covered and provide an overview of the many disciplines involved in forensic science. Having completed the course, the student will be aware of the multidisciplinary nature of forensic science, how a case is studied, the use of scientific techniques in case investigations and the presentation of evidence in court. The student will be encouraged to develop a critical approach to assessing evidence. 3 cr, 3 lec, 2 tut (biweekly).

FSCI 2010U Crime Scene Science. This course introduces students to all the processes that occur at a crime scene. Students will be taught

crime scene procedures, from the photography of the scene and record keeping at the scene through to the preservation and collection of evidence from crime scenes. This will include techniques for the recovery of fingerprints, footwear marks, and tool marks and the collection and correct packaging of items such as hairs, fibres, glass and paint. Students will also be introduced to the legal and documentary framework that accompanies the collection and preservation of evidence. In addition to theoretical knowledge, students will experience the practicalities of searching for and recovering evidence from crime scenes. The evidence will be examined and considered in terms of the amount of information that can be obtained from the analysis. The module will stress the multidisciplinary nature of forensic investigations and integrate legal, practical and scientific aspects of crime scene investigations. 3 cr, 3 lec, 3 lab (biweekly), 3 oth (biweekly). Prerequisites: FSCI 1010U and clear standing in any one of the forensic science, physics specialization in forensic physics, or computing science specialization in digital forensics programs.

FSCI 3010U Criminalistics I. Building on the material introduced in crime scene science, this course provides experience of major crime scene investigation, such as aggravated burglaries and vehicular and arson investigation. Importantly, it also provides the principles of the laboratory based searching and recovery of evidence and the techniques and principles involved in the analysis of forensic evidence, such serial number restoration, firearms examination, ballistics, and post-blast investigation. The module will stress the multidisciplinary nature of forensic investigations by intergrating legal, practical, and scientific aspects of major scene investigations. This module will include a mock court demonstration and presentation of evidence in courts of law. , glass, tool marks, footwear and tire marks, handwriting and document analysis, firearms examination and ballistics, fingerprints. 3 cr, 3 lec, 3 lab (weekly). . Prerequisites: FSCI 2010U and clear standing in any one of the forensic science, physics specialization in forensic physics, or computing science specialization in digital forensics programs.

FSCI 3020U Forensic Biology. Forensic Biology introduces the application of biological principles to forensic science. The course focuses on laboratory standards and DNA typing techniques and their application to forensic science, including the principles of genetics, serology and DNA profiling. The module will also incorporate the topics of DNA databanking, warrant processing, and presentation of DNA evidence in courts of law. 3 cr, 3 lec, 3 lab. Prerequisites: FSCI 2010U, BIOL 2020U, BIOL 2030U, BIOL 2040U, and clear standing in year three, semester one in the forensic science program.

FSCI 3030U Criminalistics II. This course builds on the material introduced in Criminalistics I. This module will introduce light theory and will provide students with the ability to identify, collect and analyze fibres and other trace material, biological fluids, and bloodstain patterns as it relates to sexual assault and violent offences. It also incorporates the principles of handwriting and questioned document analysis. The objective is to identify all the relevant forensic data to support the case, carry out the relevant analysis and produce a report and presentation suitable for court use detailing the findings.3 cr, 3 lec, 3 lab. Prerequisite: FSCI 3010U and clear standing in the forensic science program.

FSCI 3040U Forensic Chemistry. Forensic chemistry introduces the application of analytical chemistry to forensic science. The course focuses on chromatographic and spectroscopic techniques and their applications to forensic science, including: ink and toner identification, paint characterization, examination of tapes and adhesives, fire and explosion investigation, and detection of gunshot residue. The module will also incorporate the principles of light theory and chemical enhancement of fingerprints.3 cr, 3 lec, 3 lab (weekly). Prerequisites: FSCI 2010U, CHEM 2030U and clear standing after year three, semester one of the forensic science program.

FSCI 4010U Forensic Psychology. An overview of the principles of forensic psychology, including: theories of the criminal, offender profiling, risk assessments, lie detection, and psychology of evidence and criminal proceedings. 3 cr, 3 lec, 2 oth (biweekly). Prerequisite: clear standing in year four of the forensic science program.

FSCI 4020U Forensic Medicine. A continuation of the topics of forensic biology, including: molecular markers of individuality (DNA profiling and genetic analysis), immunology, forensic pathology, forensic toxicology (analysis

and detection of drugs, toxins and their metabolites), forensic taphonomy (death and decomposition processes). 3 cr, 3 lec, 3 lab (biweekly), 2 oth (biweekly). Prerequisite: FSCI 3020U and clear standing in the forensic science program.

FSCI 4030U Drug Chemistry and Toxicology. This course builds on forensic chemistry, forensic biology, and pharmacology and toxicology, and examines the use of drug chemistry and toxicology. The course reviews the roles of the forensic chemist and toxicologist with respect to the forensic analysis of drug samples and drug metabolites in biological matrices. Throughout the course, students will be exposed to a detailed case study for which they will have to identify the proper methods for forensic analysis, examine the result of the analysis and draw conclusions regarding the cases. 3 cr, 3 lec, 3 lab (biweekly), 2 oth (biweekly). Prerequisites: BIOL 3020U, FSCI 3020U, FSCI 3040U and clear standing in the forensic science program.

FSCI 4050U Law for Forensic Scientists. This course explores aspects of criminal law, with the goal of understanding forensic science within a legal context. Topics include: structure of the courts system and the criminal procedures used in it, roles of the forensic scientist in criminal procedures, rules of evidence, role of expert witness. 3 cr, 3 lec, 2 oth (biweekly). Prerequisite: Clear standing in any one of the forensic science, physics specialization in forensic physics, or computing science specialization in digital forensics programs.

FSCI 4410U Forensic Science Thesis Project I. The thesis project provides students with the opportunity, under the supervision of a faculty member or a forensic professional, to integrate and synthesize knowledge gained throughout their program of study and to satisfy specific objectives and requirements. The project will be selected to include research that has been approved by the supervising faculty member and forensic professional. Students will submit a progress report at the end the first semester. 3 cr, 9 oth. Prerequisite: Students will have completed 90 credit hours in their area of specialization and be in clear standing, and must obtain prior consent of a faculty member. Note: Students are expected to take FSCI 4420U in the following semester

FSCI 4420U Forensic Science Thesis Project II. A continuation of the project started in FSCI 4410U. Students will make presentations based on their research and submit a written thesis at the completion of the project. 3 cr, 9 oth. Prerequisite FSCI 4410U. Note: students are expected to take this course immediately following FSCI 4410U.

HLSC 0880U Health Science - Bridging. This course provides students with the opportunity to review and enrich their knowledge in science concepts which are fundamental to the study of health science. Review of essential mathematics, physics, chemistry and human biology will be provided. Assignments will be designed to assess and develop skills in scientific inquiry and application of fundamental science and mathematics to situations encountered in professional practice. 3 cr, 3 lec.

HLSC 1200U Anatomy and Physiology I. This course introduces normal anatomy and physiology as scientific disciplines. Focusing on homeostasis and the interrelationships of structure and function as the underpinnings for the maintenance of life, the human organization from the molecular to the system levels will be studied, with specific attention to the organization of the human body, principles of support and movement, and the nervous system. Students will also develop a working scientific vocabulary to communicate effectively within the scientific community. This is the introductory component of a two-semester investigation of human biology. 3 cr, 3 lec, 1 tut.

HLSC 1201U Anatomy and Physiology II. This course is a continuation of Anatomy and Physiology I. With continued focus on homeostasis and the interrelationships of structure and function, focus will be on the systems level of human physiology. The scientific investigation of the circulatory systems including both the cardiovascular and lymphatic systems are further areas of study, along with the respiratory, digestive, urinary, and reproductive systems. The concept of homeostasis will be investigated in depth as it relates to fluid, electrolyte and acid-base balances. 3 cr, 3 lec, 1 tut. Prerequisite: HLSC 1200U.

HLSC 1300U Information and Communication Technology in Health Care. An introductory course that provides instruction and experiences that will assist first-year students in making a successful transition into the uni-

versity community and the use of computers in health care. The course is designed to develop personal-management skills, acquire a comprehensive orientation to university personnel, facilities, and other resources for use in the UOIT web-centric and laptop environment in health sciences. Modules will be included on time management, e-etiquette, web tools, spreadsheets, file management, presentation tools, and online reference tools. 3 cr, 3 lec.

HLSC 1801U Health and Wellness. This introductory course explores the foundations of promoting health and wellness, examines current research, and provides an overview of strategies and approaches used in community settings. The central premise of the course is that health promotion action should assist individuals and groups to empower themselves and bring about change in order to optimize health and quality-of-life. 3 cr, 3 lec.

HLSC 1802U Introduction to Health Care Systems. This course is designed to introduce health science students to the inter-relationships between the factors that influence health and health care. Students will explore the determinants of health, health populations, how the health care system is organized in Canada and how health care policies are formulated. 3 cr, 3 lec.

HLSC 2030U Theory and Practice of Interpersonal Communication. An interdisciplinary course in interpersonal communication, designed to provide health sciences students with theory and practice in core individual and group communication principles that will prepare them for professional relationships with clients, colleagues team members and supervisors in the complex environment of the health care community. 3 cr, 3 lec. Prerequisite: 24 credit hours.

HLSC 2201U Introduction to Health Information Management. Introduces the basic principles of health information management as applied to a variety of health and social areas. Explores knowledge and skills in the field of health data collection, storage and process communication. Demonstrates the proper use of medical terminology. 3 cr, 3 lec. Prerequisites: HLSC 1201U, HLSC 1802U.

HLSC 2202U Comprehensive Anatomy and Physiology. This course will introduce and connect normal anatomy, physiology and biochemistry as scientific disciplines with particular emphasis on the application of relevant concepts to the clinic. Students with previous clinical experience, will enrich their practice by updating their knowledge and refreshing skills to apply and integrate basic concepts to clinical practice. 3 cr, 3 lec. Note: Enrolment in this course is limited to students registered in the Post RPN or Post RN programs.

HLSC 2460U Pathophysiology I. This course will be an introduction to human disease and focus on how alterations in homeostatic mechanisms disrupt the human body. It will initially concentrate on central concepts of pathophysiology such as how cells and tissues respond to pathogenic challenges, principles behind genetic disorders, alterations in immunity and inflammation, stress and disease and cancer biology. These principles will be then applied to understanding the pathogenesis of common diseases affecting the neurologic, endocrine and reproductive systems. A good understanding of normal anatomy and physiology is an essential prerequisite. 3 cr, 2 lec, 1.5 tut. Prerequisite: HLSC 1201U or HLSC 2202U.

HLSC 2461U Pathophysiology II. This course will build on the HLSC 2460U Pathophysiology I course. The student will explore common disorders in specific systems including hematologic, cardiovascular, respiratory, urinary, gastrointestinal, musculoskeletal and integumentary. The course will finalize with a look at multiorgan dysfunction syndromes, including those associated with shock and burns. A good understanding of normal anatomy and physiology, and a solid pathophysiology background are essential prerequisites. 3 cr, 2 lec, 1.5 tut. Prerequisite: HLSC 2460U.

HLSC 2501U Health Law. This course introduces students to the legislation and practices that govern the health care system in Canada. It emphasizes the legal and ethical responsibilities that health care professionals have and examines the importance of documentation for both the provider and the client. 3 cr, 3 lec. Prerequisite: 24 credits.

HLSC 2601U Introduction to Health Management. Examines key areas that comprise the field of health care management by building on the root disciplines of organization theory, strategic management and organi-

zational behaviour. Topics include the design and managerial roles in health care organizations, leadership and motivation, work team performance, and interorganizational relationships. 3 cr, 3 lec. Prerequisite: 24 credits.

HLSC 2801U Health, Illness and Therapeutics. This course is designed to introduce health science students to the common terminologies and practices of health care delivery and documentation. Students will critique definitions of health and disease and the medicalization of the life cycle. They will explore diagnostic and therapeutic modalities and will contextualize these practices as they are encountered in various institutionalized settings in the health care system. 3 cr, 3 lec. Prerequisite: 24 credits.

HLSC 2820U Nutrition for Health Science. This course will focus on nutrition as a determinant of health. Learners will examine the basic principles and applications of nutrition throughout the life cycle. Physiological, psychological, socio-economic, physical, educational and cultural factors which influence both access to food and eating behaviours are explored using a population health promotion framework. Special emphasis is given to innovative and effective community-based nutrition programs and services in Canada targeting at-risk groups and the identification of appropriate nutrition-related community resources. 3 cr, 3 lec. Prerequisite: HLSC 1201U or HLSC 2202U.

HLSC 3201U Coding and Abstracting. This course provides an in-depth study of the coding process in order to prepare students to code diagnoses and procedures according to the classification systems used. Students will also be provided with experience in abstracting and data analysis. 3 cr, 3 lec. Prerequisite: HLSC 2201U.

HLSC 3420U Theory and Practice of Patient Centre Care. This course provides students in the Health Sciences with the breadth and depth of knowledge to understand and evaluate patterns of care giving likely to improve patient outcomes. Interdisciplinary and integrative perspectives are used to examine the medical, nursing, medical laboratory, and information management facets of patient-centered care. Students use an evidence-based framework to analyze elements of patient-centered care, including human interactions, alternative and complementary medicine and nursing, family involvement, access to education and information, nutrition, architectural design of care giving settings, as well as the importance of therapeutic touch, the, arts, and spirituality in healing. 3 cr, 3 lec. Prerequisite: HLSC 2460U or HLSC 2202U.

HLSC 3462U Advanced Pathophysiology. This course focuses on the development of skills by which future health professionals will be able to use pathophysiology in clinically significant ways. It does so by emphasizing the application and integration of important pathophysiological concepts into clinical case situations, published research studies, self-generated clinical questions and education. Prerequisite: a grade of at least B- in, HLSC 2460U Pathophysiology I, HLSC 2461U Pathophysiology II.

HLSC 3601U Managing Health Care Teams. The use of well organized cross-functional teams has led to dramatic improvements in innovation, productivity and levels of service for organizations in all sectors. The course will focus on the meaning and nature of purposeful relationships with an emphasis on interpreting and facilitating team interactions. Students will deal with issues such as empowerment, team building, motivation, diversity, conflict management, negotiation and change. 3 cr, 3 lec. Prerequisite: HLSC 2601U or NURS 1420U.

HLSC 3630U Health Finance. This course is designed to introduce students to the methods of funding health care institutions and budget preparation as a management tool. The major components to the course include financial management, factors included in budget preparation, techniques of preparing staffing patterns as well as capital and operating (staff/supply) budgets, cost monitoring and variance analysis. 3 cr, 3 lec. Prerequisite: HLSC 2601U.

HLSC 3710U Ethics. In this course the student will examine theories related to the ethical foundations of health care practice. In particular, the student will examine the professional code of ethics for health professions and the role of the health disciplines in advocating for improved health care. Ethical decision-making will be explored. 3 cr, 3 lec. Prerequisite: 24 credit hours.

HLSC 3800U Critical Appraisal of Statistics in Health Science. This course offers an introduction to critical appraisal skills in assessing evidence presented in health science, with a focus on real-life relevance. The application of statistical methods to the study of research questions will be explored in terms of both descriptive and inferential statistics. Topics to be included are: randomized experiments and observational studies, measurements, frequency distribution, measures of central tendency and variability, correlation and regression, sample survey, probability, confidence intervals construction and hypothesis testing. 3 cr, 3 lec. Prerequisite: 24 credit hours.

HLSC 3805U Epidemiology and Health Inquiry. This course will use a case-based format to introduce the principles of epidemiology to disease conditions such as infectious disease, genetic diseases, cancer and occupational/ environmental illness. The focus in this course is to understand the burden of illness from a biological, social, economic and political perspective. 3 cr, 3 lec. Prerequisite: HLSC 3800U.

HLSC 3910U Research Methods for Health Care Professionals: Theory and Application. This course will critically examine a variety of research theories and methodologies employed by both quantitative and qualitative allied health care researchers. The student will be able to critically examine, interpret, analyze and apply findings from published research reports from both human and non-human investigations conducted in a variety of laboratory, clinical and community-based research settings. The course will critically examine how published research reports are utilized as the basis for evidence-based practice. Students will have an opportunity to engage in hands-on quantitative and qualitative research experiences including formulating research questions, research design, data collection, data base management and coding, interpretation of findings, and their implications for practice. 3 cr, 3 lec. Prerequisite: HLSC 3800U.

HLSC 4201U Advanced Health Information Management. Building on the concepts presented in the introductory course, students will look at topics related to data collection, analysis and storage in more depth. In particular, students will look at the complexities of the coding and classification of medical data. The course will include a laboratory component covering spreadsheets and databases and practice with various coding systems. Also we will discuss issues related to freedom of information, privacy, confidentiality and security of information, and legal issues in dealing with health information. 3 cr, 3 lec. Prerequisite: HLSC 220IU.

HLSC 4610U Systems Analysis in Health Care. An introduction to the techniques of operations research and their application to health-care systems. Topics may include: scheduling, resource allocation, inventory management, decision-support systems, forecasting, risk assessment and analysis. 3 cr, 3 lec. Prerequisite: HLSC 3800U.

HLSC 4620U Project Quality Improvement. Quality is achieved through planning, directing and implementing the actions that are consistent with the concept of doing the right thing right the first time. Students will learn the tools of quality management, quality assessment and quality assurance in a health care setting. Students will learn how to identify the quality principles, continuous improvement concepts, and to review and determine the cost of quality. 3 cr, 3 lec. Prerequisite: HLSC 3800U, HLSC 3630U.

HLSC 4850U Current Issues in Health Care. This course is designed to assist students in explaining current trends and issues confronting the health care system and health care professionals. Issues include, but are not limited to, technology in health care, the role of interprofessional health care teams, economic and political aspects of health care, influences on health policy, the roles of regulatory bodies, and globalization. 3 cr, 3 lec. Prerequisite: 54 credit hours.

HLSC 4998U Research Project I. The research project provides students with the opportunity, with the guidance of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The project topic will be selected to include some aspects of the student's area of interest or specialization. Students will be required to organize and conduct a project with a significant analytical component, including consideration of technical, economic, and other broad based impacts. The requirements include a written paper and an oral presentation of the project outcomes. The project will be conducted over two semesters, with the

project focus and literature review and the project proposal prepared in semester one and the complete paper and class presentation completed in semester two. HIM students will include practicum/experiential learning as part of the planning for their project. 3 cr. Prerequisites: BIOL 1020U, HLSC 2461U, HLSC 2801U, HLSC 3630U, HLSC 3805U, HLSC 3910U.

HLSC 4999U Research Project II. The research project provides students with the opportunity, with the guidance of a faculty member, to integrate and synthesize knowledge gained throughout their program of study. The project topic will be selected to include some aspects of the student's area of interest or specialization. Students will be required to organize and conduct a project with a significant analytical component, including consideration of technical, economic, and other broad based impacts. The requirements include a written paper and an oral presentation of the project outcomes. The project will be conducted over two semesters, with the project focus and literature review and the project proposal prepared in semester one and the complete paper and class presentation completed in semester two. 3 cr. Prerequisite: HLSC 4998U.

INFR 1010U Discrete Mathematics. This course addresses the following topics: sets and set operations, propositional logic, predicate logic, rules of inference; methods of proof and reasoning, modular arithmetic, counting, pigeon-hole principle, induction, deduction, relations, functions, graphs, graph algorithms, shortest path, trees, combinatorics; applications to cryptosystems, hashing functions, coding. 3 cr, 3 lec, 3 tut (biweekly).

INFR 1100U Introduction to Programming. This course introduces students to general computer programming principles, logics and problem solving skills. Topics include data types, variables, operators, expression, statements, blocks, control flow statements, functions (routines), arrays, pointers, and basic concepts of structures. The course uses a programming language such as C or C++ for illustrating the principle programming concepts. 3 cr, 3 lec, 1.5 tut.

INFR 1300U Creative Writing and Narrative Concepts. This course introduces the concepts of creative writing and narration in relation to game creation. 3 cr, 3 lec.

INFR 1310U Drawing I. This is an introduction to the fundamental concepts of drawing, visual image creation, colouring and lighting perspective. 3 cr, 3 lec, 3 lab.

INFR 1320U Graphic Design. This course introduces the history, current technology, and design principles of graphic design and presents an overview of the basic formal elements and principles of two-dimensional design, and visual and creative thinking strategies. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1310U.

INFR 1350U Imaging I. This course introduces the fundamental knowledge of colour and light covering the various processes on how colour images are captured and recorded in chemical and digital imaging system. Students will learn ways to manipulate various project components in the production and postproduction process using an imaging system. This course helps students develop an understanding of the methods appropriate to research in colour imaging. Students will study methods for image acquisition and reproduction in the context of production systems. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1320U.

INFR 1410U Basics of Networking, Routers and Routing. This course is a combination of the Cisco Academy Program CCNA1 and CCNA2 covering the following topics: Computer hardware and software, electricity, networking terminology, and protocols; LANs and WANs, Open System Interconnection (OSI) model, Ethernet, and Internet Protocol (IP) addressing, design and documentation of a basic network and structured cabling, and network-tonetwork communications; Router user interfaces, components and configuration, basics of IOS versions, naming and software backup, TCP/IP Protocol Suite and IP addressing and subnetting, and Internet routing protocols - RIP, IGRP. 3 cr, 3 lec, 3 lab.

INFR 1420U Switching Basics, Intermediate Routing, and WAN Technologies. This course is a combination of the Cisco Academy Program CCNA3 and CCNA4 covering the following topics: Switching and VLANs, spanning-tree protocol, routing and routing protocols, access control lists (ACLs), and network documentation, security and troubleshooting; WAN devices, encapsulation formats, and communication, PPP components, session establishment, and authentication, ISDN

uses, services, and configuration, frame relay technology and configuration. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1410U.

INFR 1500U Information Technology. IT: principles, state-of-the-art, opportunities, and trends; IT applications: science, engineering, and daily life; computer hardware: I/O devices, semiconductor memory, secondary storage devices, CPU, peripheral equipment; computer software: application and system software, including operating systems, utilities; web browsers; Internet, wired and wireless media, networks, and architectures; IT design criteria (complexity, performance) and constraints (costs, regulations, schedules). 3 cr, 3 lec.

INFR 2140U Object Oriented Programming. Based on the introduction to programming course, the fundamental concepts and techniques of object-oriented programming is introduced and explored in this course. To learn the fundamental concepts and techniques behind object-oriented programming in C++ or Java. They include: abstract data types (classes, objects, and methods); creation, initialization, and destruction of objects; class hierarchies and inheritance; polymorphism and dynamic binding. In addition, generic programming using templates and algorithm abstraction will also be discussed. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1100U. Cross-listed: BUSI 3540U.

INFR 2310U Drawing II (Animation). This course introduces students to the concept of character animation and to provide students with a solid understanding of the compositing, modelling, animation, texturing, lighting and rendering. Students will also learn to develop traditional animation skills in the areas of storyboarding, character design, animation theory, and camera layout. - Animation with advanced level contents focusing on theoretical aspects of animation development. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1320U.

INFR 2330U Game World I. This course introduces the design and development of storyboarding, characters, background settings, animation, and related topics for game production. It will continue with the design and development of game production by incorporating highly developed modelling techniques. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 1350U, INFR 2310U.

INFR 2350U Imaging II (Graphical Data Processing). Working with graphical data: The basic concepts, tools and techniques of computer graphics are described, and the fundamental transformations of scaling, translation, rotation, windowing, hidden line removal, image processing and clipping are presented. Mathematical tools needed for the geometrical aspects of computer graphics are discussed. Particular emphasis will be placed on new developments in microcomputer graphics. Students will be expected to develop a graphics application in C++ and/or JAVA in conjunction with available graphics libraries. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 1350U, INFR 2140U.

INFR 2370U Sound and Audio. This course is an introduction to digital sound and audio concepts and their applications in multimedia production. It introduces students to the concepts of programming with sound and audio data. Throughout the course students will apply the theoretical concepts in gaming related programming projects. It presents an overview of gitter, dither and word lengths, high sample rates, distortion, headroom, monitor calibration, metering, depth perception, compression and expansion, equipment interconnection and other digital audio related topics. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2140U.

INFR 2410U Advanced Routing and Remote Access. This course is a combination of the Cisco Academy Program CCNP1 and CCNP2 covering the following topics: selecting and configuring scalable IP addresses, implementing technologies to redistribute and support multiple, advanced, IP routing protocols such as OSPF, EIFRP, and BGP, configuring access lists, designing and testing edge router connectivity into a BGP network; configuring asynchronous connections, point-to-point Protocol (PPP) architecture, protocol, callback, and compression, ISDN architecture, protocol layers, BRI and DDR, configuring X.25, frame relay, and AAA. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1420U.

INFR 2420U Multilayer Switching. This course is a combination of the Cisco Academy Program CNNP3 and CCNP4 covering the following topics: fast Ethernet, gigabit Ethernet, VLAN basics, types, identification, and trunking protocol, spanning tree protocol, MLS processes, and configuration, multicasting protocols, routing, and tasks; troubleshooting in OSI layers 1, 2, and 3, TCP/IP, LAN switching, VLANs,

frame relay, ISDN, Appletalk, Novell, EIGRP, OSP, BGP. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2410U.

INFR 2430U Network Troubleshooting. This course is part of the Cisco Academy Program CCNP4 covering the following topics: fast Ethernet, gigabit Ethernet, VLAN basics, types, identification, and trunking protocol, spanning tree protocol, MLS processes, and configuration, multicasting protocols, routing, and tasks; troubleshooting in OSI layers 1, 2, and 3, TCP/IP, LAN switching, VLANs, frame relay, ISDN, Appletalk, Novell, EIGRP, OSP, BGP. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2420U.

INFR 2470U CISCO Security I: Fundamentals of Network Security. This is part of the Cisco Fundamentals of Network Security that introduces students to design and implement security solutions that will reduce the risk of revenue loss and vulnerability. Topics include: security policy design and management; security technologies, products and solutions; firewall and secure router design, installation, configuration and maintenance; AAA implementation using routers and firewalls; and VPN implementation using routers and firewalls. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 1420U.

INFR 2480U CISCO Security II: Network Security. This is a continuation of the Cisco Security I course, covering security technologies on voice and data communications, wireless LANs, and other related networking technologies. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2470U.

INFR 2550U Information Technology Project Management. This course focuses on information technology projects and applies basic project management theory on handling and managing those projects. It introduces the concepts and tools that are appropriate for phases of project life cycle, and incorporates areas outlined in the Project Management Institute's Project Management Body of Knowledge (PMBOK) into the basic concepts associated with information systems management and software engineering. 3 cr, 3 lec. Prerequisite: INFR 1500U.

INFR 2570U Cybercrime. This course covers different manifestations of cybercrime, including hacking, viruses and other forms of malicious software. It presents technical and social issues of cybercrime, and to study the origins and extent of the cybercrime problem as well as the commercial and political evolution of the computer hacker. 3 cr, 3 lec.

INFR 2610U OS Security I: Windows. This courses is a definitive security study on Microsoft operating systems, servers, clients, networks, and Internet services. It covers comprehensive security operations and deployment information, along with security tools available on the Web. 3 cr, 3 lec, 3 lab. Corequisite: INFR 2830U.

INFR 2620U OS Security II: Unix. This course is a definitive security study on Unix operating systems, servers, clients, networks, and Internet services. It covers comprehensive security operations and deployment information, along with security tools available on the Web. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2830U.

INFR 2810U Computer Architecture. Computer systems generation: main-frame, mid-range, micro-computers; peripherals and interfaces; bus design; input/output systems and technologies; central processing units: arithmetic logic and control units; semiconductor memory (RAM and ROM), magnetic disks and tapes, optical disks; assembly and high-level programming language; integer and floating point arithmetic, pipelining and parallelism; CISC vs. RISC. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 1100U, INFR 1500U.

INFR 2820U Algorithms and Data Structures. This course presents an overview of fundamental theories and knowledge in data structures and the associated algorithms. This course introduces the concepts and techniques of structuring and operating on abstract data types in problem solving. In addition, this course also discusses sorting, searching and graph algorithms, and the complexity and comparisons among these various techniques in computing and software development. 3 cr, 3 lec, 3 lab, 3 tut. Prerequisites: INFR 1010U, INFR 1100U.

INFR 2830U Operating Systems. This course presents an overview of operating systems from the structure, performance, and design of operating systems. This course also covers the basis concepts of various operating systems, specifically Windows and Unix. 3 cr, 2 lec, 2 lab. Prerequisite: INFR 1100U or BUSI 1830U.

INFR 3110U Game Programming. This course presents the techniques, ideas, and solutions for game programmers and introduces various programming languages used in game development. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 2330U, INFR 2350U, INFR 2370U.

INFR 3120U Web Programming. This course covers the design of web applications and the use of programming tools such as JavaScript, VBScript, ActiveX, Active Server Pages, and Perl. The topics include structure, presentation format, lists, links, images, tables, frames, and forms. An emphasis is placed upon the appropriate use of the programming tools introduced. 3 cr, 3 lec, 3 lab. Prerequisite: BUSI 2140U.

INFR 3310U Animation Arts. This course is to provide students with solid conceptual and critical basics through a combination of technical explanations and creative techniques; this course addresses the newest techniques available in the latest software programs and hardware to create and output fully rendered three-dimensional computer still images, animations, and effects. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 1320U, INFR 2370U.

INFR 3320U Filmmaking. This course presents an overview of the history and art of film with respect to lighting, layout, cinematography, screen direction and character studies. It introduces the preproduction processes of storyboarding the production of leica reels in the critical development of project concepts, and produces in combination of both traditional and digital process. Production processes, studio roles, editing and postproduction will be addressed. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2350U.

INFR 3330U Game World II. This course introduces the design and development of storyboarding, characters, background settings, animation, and related topics for game production. It will continue with the design and development of game production by incorporating highly developed modelling techniques. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 2330U, INFR 3110U.

INFR 3340U Modelling and Rigging. This course introduces the fundamental knowledge of developing 3D models using computer software. Topics include character modelling and bones, designing joints and creating chains with constraints for easy animation, facial modelling and lip sync, designing faces with economical splinage to simplify facial animation, breaking down voice tracks into phonemes and animating facial and body language to match the track. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 3310U.

INFR 3710U Signals and Random Processes. This course covers signals and systems classifications; linear, time-invariant systems; impulse response and transfer function; convolution; definitions and applications of Fourier series, Laplace transform, Fourier transform, discrete-time signals and systems, Z-transform, and discrete Fourier transform. Random variables and probability density and distribution functions; central limit theorem, additive White Gaussian noise; random processes and their applications in communications systems and networks. 3 cr, 3 lec. Prerequisites: INFR 1010U, INFR 1500U.

INFR 3720U Basics of Digital Transmission. Introduces the digitization: filtering, sampling, quantization, A-to-D and D-to-A conversion, line coding; fundamentals of source and channel coding; multiplexing: TDM, FDM, WDM; baseband and passband systems; modulation: pulse modulation (PAM, PPM, PDM) and digital modulation (binary and M-ary transmission); Nyquist-I criterion and intersymbol interference; adaptive equalization; power, bandwidth, performance, and complexity trade-offs; digital communication systems; 3 cr, 3 lec. Prerequisite: INFR 3710U.

INFR 3730U Multimedia Systems. Theory, features, design, performance, complexity analysis and application of multimedia engineering technologies; digital signal compression: audio, image, video, characterization, compression requirements; source entropy and hybrid coding, transform and wavelet-based coding; motion estimation; object-based processing, and multimedia indexing and retrieval. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 1010U, INFR 2140U.

INFR 3810U Database Systems. This course introduces the field of database systems for students with a basic of knowledge of storage and file management capabilities of a modern computer system and features of one or more high-level programming language. Coverage includes general concepts, the relational model, theory and practice of database design, transaction management, how relational concepts are relevant to other aspects of database technology, and the impact of

object technology on database systems. It also covers security issues of database systems, including disaster recovery and network intrusion. 3 cr, 3 lec. Prerequisites: INFR 1100U, INFR 1500U.

INFR 3830U Distributed Computing. Network history and architectures; reference Model for Open Systems Interconnection (OSI): descriptions, examples, and applications; routing, multicast deliver; TCP/IP protocol suite; network topologies (ring, bus, tree, star, mesh); local area networks, WAN, wireless networks, the Internet: P2P networking, distributed computing models. 3 cr, 3 lec. Prerequisites: INFR 2140U, INFR 2810U.

INFR 3850U Enterprise Network Management. This course is to provide the knowledge and skills needed to install, administer, and manage an enterprise network using operating systems such as Windows and Unix. It also covers building a secure firewall, VPN, and related topics. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 1420U, INFR 2830U.

INFR 4310U Internet Gaming Development. This course introduces the design, development, and management of online, multi-user and massive multi-user games. It covers the technological and business aspects of Internet game development, and presents an overview of the current Internet game industry. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 3330U, INFR 3830U.

INFR 4320U Artificial Intelligence for Simulations and Gaming. This course introduces key AI game programming issues and provides ideas and techniques to be integrated into games development. It also presents an overview of AI architecture, rule based systems, level of detail AI and script language issues, expert systems, fuzzy logic, neural networks, and genetic algorithms. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 3330U. INFR 4340U Game Production and Documentation. This course provides an overview of game production cycles, preparation of user documentation, writing of strategic game playing, business models, development resource and models, legal issues, and other related topics. 3 cr, 3 lec, 3 tut. Prerequisite: INFR 3330U.

INFR 4350U Immersive Environments, Virtual Reality. Virtual reality is a very powerful and compelling computer application by which humans interact with computer-generated environments in a way that mimics real life and engages various senses. This course provides an overview of current virtual reality technology and its applications and presents an analysis of the engineering, scientific, and functional aspects of virtual reality systems and the fundamentals of VR modelling and programming. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 2350U, INFR 3340U, INFR 4320U.

INFR 4390U Design Studio. This course is project- based. Students are required to develop a game as approved by the faculty. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 4310U, INFR 4320U.

INFR 4410U Routing/Switching and Service Providers. This is the first CCIE series course to prepare students for the CCIE examination. This covers expert level knowledge of networking across various LAN and WAN interfaces and a variety of routers and switches. The course presents ways to solve complex connectivity problems and apply technology solutions to increase bandwidth, improve response times, maximize performance, improve security, and support global applications. The course covers expert level knowledge and skill in the fundamentals of IP and core IP technologies such as unicast IP routing, QoS, multicast, MPLS, MPLS VPNs, traffic engineering, multiprotocol BGP, etc., as well as specialized knowledge in at least one of the networking areas specific to service providers. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2430U.

INFR 4420U Security. This course is the second in the CCIE series to prepare students for the CCIE examination. This course covers expert level knowledge and skill in configuring and maintaining secure networks. CCIE Security certified individuals are experts in the fundamentals of IP and IP routing, as well as the specific area of security protocols and applications. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 4410U. INFR 4430U Voice. This is the third course in the CCIE series to prepare students for the CCIE examination. The course covers expert level knowledge and skill in configuring and maintaining VoIP solutions in the enterprise environment. CCIE Voice certified individuals are experts in key technologies and products involved in a Voice over IP solution. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 4420U.

INFR 4550U Law and Ethics of IT. This course

provides an overview of topics related to legal, ethical, and social issues arising from the use of information technology. It also covers areas such as cybercrime, privacy, intellectual property, and equitable access. 3 cr, 3 lec. Prerequisite: Completion of all 3000-level required courses.

INFR 4610U IT Security. This course introduces the concepts and applications of IT security and provides students with the knowledge in exploring new nature of IT-related threats. The course will provide both technological and social aspects of IT security. 3 cr, 3 lec. Prerequisites: INFR 2430U and completion of all 3000-level required courses.

INFR 4620U Emerging IT Security Technologies. This course presents the current trends on research and development in IT security technologies and discusses issues and standards from a technological and management perspective as they relate to the management of large networking systems and computer environments. The course also provides an in-depth examination of IT security hardware and software choices deals with the need to tailor networking operating systems to fit a corporation's enterprise networks. 3 cr, 3 lec. Prerequisite: INFR 3850U.

INFR 4630U Malware Worms and Viruses. This course presents different types of malware, such as viruses, worms, malicious code delivered through Web browsers and e-mail clients, backdoors, Trojan horses, user-level RootKits, and kernel-level manipulation. The course covers characteristics and methods of attack, evolutionary trends, and how to defend against each type of attack. 3 cr, 2 lec, 2 lab. Prerequisites: INFR 2140U, INFR 2610U, INFR 2620U.

INFR 4640U Web Services Security. This course presents an overview of Web Services architecture and issues related to its security. It also introduces ways to build a secure Web services system and covers security technologies used for providing secure Web services, emphasizing how security works with XML and SOAP. 3 cr, 3 lec, 2 lab. Prerequisite: INFR 3120U.

INFR 4650U VPN and Data Privacy. This course introduces to the development, implementation, and maintenance of Virtual Private Networking (VPNs). Covers topics such as User Authentication and QOS, deployment levels, tunnelling protocols, service level guarantees, and traffic management. Discusses issues on weaving VPN technology into overall information technology infrastructure, and study how VPNs facilities e-commerce as well as intra-organizational networking. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 2480U, INFR 2830U.

INFR 4660U E-Business Security. This course presents an overview of the state-of-the-art in e-business security. It examines the most recent attack strategies and offers specific technologies and techniques for combating attempts at data infiltration, destruction, and denial of service attacks. Taking the view that security must be incorporated within multiple levels of e-business technology and practice, the course presents measures for securing system platform, applications, operating environment, processes, and communication links. It shows how the traditional security technologies of firewalls and Virtual Private Networks (VPNs) can be integrated with risk management, vulnerability assessment, intrusion detection, and content management for a comprehensive approach to security. 3 cr, 3 lec. Prerequisites: INFR 2820U, INFR 3810U.

INFR 4680U IT Security Policies and Procedures. The objective of this course is to provide an understanding of the need for the multi-disciplinary involvement, an understanding of where this involvement fits into the policy development lifecycle and a methodology that provides a means of implementing this development lifecycle into an organization. The course discusses how the policy development process should be something that requires the involvement of key business decision makers of which information security is only one. 3 cr, 3 lec. Prerequisites: BUSI 2501U, INFR 4550U.

INFR 4750U Advanced Communication Networks. Networks are the essential components to information transmission, without which there are no communications. This course presents telecommunications networks fundamentals, and emphasizes advanced topics and detailed network architectures. The course gives detailed descriptions of the principles associated with each layer, as well as the analytical framework of each level and highlights many examples drawn from the Internet and wireless networks. This course analyses various wireless systems. In this course, all major aspects of transmission systems and theoretical founda-

tions of computer and communications networks, as well as networking principles will be analysed and discussed in detail. 3 cr, 3 lec, 3 lab. Prerequisite: INFR 3720U.

INFR 4760U Network Performance Analysis. The course strengthens the student's understanding of fundamental concepts, requirements, and design tradeoffs, particularly as related to scheduling, congestion control, advanced routing protocols, traffic management, wireless access and mobility, and applications. Using simulation models, the course examines ways to conduct network monitoring and traffic controls. 3 cr, 3 lec, 3 lab. Prerequisites: INFR 2430U, INFR 3850U.

MATH 1010U Calculus I. Study of limits and continuity, the derivative, Rolle's theorem, the Mean-Value Theorem for Derivatives, Fermat's Theorem, the differential and antidifferentiation, the definite integral, area, the Mean-Value Theorem for Integrals, the Fundamental Theorem of Calculus, and other topics as time permits. Applications to science and engineering will be incorporated. 3 cr, 3 lec, 2 tut. Prerequisite: OAC Calculus or 12U Advanced Functions and Introductory Calculus. Credit restriction: MATH 1880U.

MATH 1020U Calculus II. A continuation of Calculus I that addresses techniques of integration, applications of integration to volumes, arc length and surface area, parametric equations, polar coordinates, functions of two or more variables, partial derivatives, differentials, Taylor and MacLauren series, double and triple integrals, and other topics as time permits. Applications to science and engineering will be incorporated. 3 cr, 3 lec, 2 tut. Prerequisite: MATH 1010U.

MATH 1850U Linear Algebra for Engineers. Develops the fundamental ideas of linear algebra and demonstrates their applications to other areas. Topics include the algebra of matrices; systems of linear equations; determinants and matrix inverses; real and complex vector spaces, linear independence, bases, dimension and coordinates; inner product spaces and the Gram-Schmidt process; least squares and regression; linear maps and 258 matrices, change of basis and similar matrices; eigenvalues, eigenvectors and matrix diagonalization; quadratic forms. 3 cr, 3 lec, 2 tut. Corequisite MATH 1010U. Credit restriction: MATH 2050U.

MATH 1880U Mathematical Modelling for Health Science. This course enables the student to gain an understanding of the use of mathematical modelling as a tool in the health sciences, and to be able to carry out such modelling at an elementary level. This will enable the student to better understand current and future developments in medical practice that are based upon the use of mathematical models. Topics and their applications will include: functions and graphs, sequences and series, difference equations, differentiation and integration. 3 cr, 3 lec, 2 tut. Credit restrictions: MATH 1010U. Note: Not for credit in a science or engineering program.

MATH 2010U Advanced Calculus I. Examines the concepts, techniques and uses of differential and integral calculus of functions of more than one variable. Topics include: vectors and the geometry of 2- and 3- dimensional Euclidean space; multivariate functions (scalar fields, limits, continuity, partial derivatives, chain rule); directional derivatives and gradients; curves and surfaces in Euclidean space; vector fields; Taylor's theorem in several variables, linear and quadratic approximations; multivariate optimization; iterated integrals over rectangular domains in 2 and 3 dimensions. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Corequisite: MATH 1850U or MATH 2050U.

MATH 2020U Advanced Calculus II. Examines the concepts, techniques and uses of vector calculus. Topics include: multivariate functions (scalar and vector fields); spherical and cylindrical polar coordinate transformations; general coordinate transformations; iterated integrals over nonrectangular domains; vector differential operators (gradient, divergence, curl); parametric curves and arclength; parametric surfaces and surface area; line integrals and surface integrals; Green's theorem, Gauss' theorem, Stokes' theorem; infinite series of real numbers and power series; uniform convergence of series of functions. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 2010U. Credit restriction: MATH 2810U.

MATH 2050U Linear Algebra. This course is designed to develop the fundamental ideas of linear algebra, and to demonstrate some applications of linear algebra to other areas. Topics include the algebra of matrices; qualitative and quantitative solutions of systems of linear equations; determinants and matrix inverses; real and complex vector spaces, and subspaces, linear independence, bases, dimension and coordinates; inner product spaces and the Gram-Schmidt process; inconsistent (overdetermined) systems of equations, least squares solutions and regression; linear maps and matrices, change of basis and similar matrices; eigenvalues, eigenvectors and matrix diagonalization; diagonalization of real symmetric matrices and quadratic forms. 3 cr, 3 lec. Prerequisite or Corequisite: MATH 1010U. Credit restriction: MATH 1850U.

MATH 2060U Differential Equations. A study of differential and difference equations that arise as models of phenomena in many branches of physical and biological sciences, in engineering, and in social science. Examples include Newtonian mechanics, chemical kinetics, and ecological system models. Students learn the basic properties of differential and difference equations, techniques for solving them, and a range of applications. 3 cr, 3 lec, 1 tut. Prerequisites: MATH 1020U, MATH 2050U. Credit restriction: MATH 2860U.

MATH 2070U Numerical Methods. Provides an overview of and practical experience in utilizing algorithms for solving numerical problems arising in applied sciences. Topics include: computer arithmetic, solution of a single nonlinear equation, interpolation, numerical differentiation and integration, solution of differential equations, and solution of systems of linear equations. Students will use computer programs in the solution of problems. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Credit restriction: MATH 2072U.

MATH 2072U Computational Science I (formerly Numerical Methods). Provides an overview of and practical experience in utilizing algorithms for solving numerical problems arising in applied sciences. Topics include: computer arithmetic, solution of a single nonlinear equation, interpolation, numerical differentiation and integration, solution of differential equations, and solution of systems of linear equations. Students will use computer programs in the solution of problems. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Credit restriction: MATH 2070U.

MATH 2080U Discrete Mathematics. This course provides a foundation in finite mathematics. Students will acquire the ability to recognise formal proofs of correctness and use various standard proof techniques to prove properties about programs and the correctness of simple graph theory algorithms. Induction proofs and recursive algorithms are introduced. The course provides students with the expertise and knowledge to appreciate the significance of the complexity of an algorithm and the relationship to the time it takes to solve a problem. Small problems are introduced and worstcase and average case analysis discussed. Formal proofs and counting arguments are presented as essential tools for the analysis of algorithms. The course facilitates appreciation of time/space trade-offs associated with algorithm design and implementation. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1000U, MATH 1020U. Corequisite: MATH 1850U or MATH 2050U. Credit restrictions: CSCI 1010U, CSCI 2110U, ENGR 2110U.

MATH 2810U Advanced Engineering Mathematics. This course extends the study of calculus and differential equations, including multiple integration: integral theorems, polar coordinates and changes of variables; differential and integral calculus of vector-valued functions of a vector variable: vector algebra, line and surface integrals, Green's, Gauss' and Stokes' theorems; introduction to partial differential equations: Heat equation, Laplace's equation, wave equation. 3 cr, 3 lec, 1 tut. Prerequisites: MATH 1020U. Credit restriction: MATH 2020U.

MATH 2860U Differential Equations for Engineers. A study of differential equations that arise as models of phenomena in engineering. Topics include: first-order equations; linear equations; second-order equations and their applications; systems of linear equations; series solutions; Laplace transforms; introduction to partial differential equations. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Credit restriction: MATH 2060U.

MATH 3020U Real Analysis. This course provides the foundation for real analysis, and prepares students for other branches of

mathematics, mathematical statistics and quantum mechanics. Students study the construction of real and complex number systems; partial and total order relations; countable and uncountable sets; mathematical induction and other techniques of proof; numerical sequences and series; absolute and conditional convergence; basic topological notions in a metric space; continuous functions; continuity and compactness; continuity and connectedness; uniform continuity; sequences and series of functions; uniform convergence; the Riemann-Stieltjes integral; rectifiable curves; fixed points and the contraction principle; introduction to one-dimensional discrete dynamical systems. 3 cr, 3 lec. 2 tut (biweekly) Prerequisites: MATH 2020U, MATH 2080U or CSCI 1010U or CSCI 2110U or ENGR 2110U.

MATH 3040U Optimization. This course introduces linear and nonlinear optimization problems and offers the concepts and techniques required for their solution. Students study: linear programming (simplex method, duality, integer programming), nonlinear programming (Lagrange multipliers, KKT optimality conditions), approximation techniques (line search methods, gradient methods, conjugate gradient methods), variational problems (Euler-Lagrange equation), dynamic programming, and optimal control. 3 cr, 3 lec, Prerequisites: MATH 2010U, MATH 2050U or MATH 1850U.

MATH 3050U Mathematical Modelling. This course provides an overview of the mathematical modelling of discrete, continuous and stochastic systems. Problems arising in physics, chemistry, biology, industry, economics, and social science serve as examples to demonstrate model development, implementation, solution and analysis. The course also provides an introduction to partial differential equations. The derivation of the heat and wave equations in one, two, and three dimensions demonstrates the power of partial differential equations as a modelling tool. Methods of solution and physical interpretation of results are stressed. The Maple and MATLAB software packages are used to facilitate the modelling process. 3 cr, 3 lec, Prerequisites: MATH 2010U, MATH 2060U or MATH 2860U, STAT 2010U or STAT 2020U or STAT 2800U.

MATH 3060U Complex Analysis. Introduces some classical theorems and applications of complex analysis. Students study basic properties of complex number; the Cauchy-Riemann equations; analytic and harmonic functions; complex exponential and logarithmic functions; branches of multi-valued functions; contour integrals; the Cauchy-Goursat Theorem and the Cauchy Integral Formula; the maximum moduli of functions; Taylor and Laurant series; analytic continuation; the residue theorem with applications; conformal mappings with applications. 3 cr, 3 lec. Prerequisite: MATH 2010U. Credit restriction: ENGR 2530U.

MATH 3070U Algebraic Structures. This introductory course in algebraic structures is designed for students in the mathematical sciences as well as physics and chemistry. Students study groups, symmetric groups, subgroups, equivalence relations; normal subgroups, factor groups, mappings and inverse mappings; the Fundamental Homomorphism Theorem; rings, subrings, ideals, quotient rings, polynomial rings, the Euclidean algorithm, the Fundamental Ring Homomorphism Theorem, finite fields, applications of groups, rings, and fields. 3 cr, 3 lec. Prerequisites: MATH 1850U or MATH 2050U, MATH 2080U or CSCI 1010U or CSCI 2110U or ENGR 2110U.

MATH 4010U Dynamical Systems and Chaos. The modern theory of differential equations studies the behaviour of solutions of nonlinear differential equations. In particular, the notion of dynamical system is crucial to the development of the theory and leads to the analysis of chaotic solutions. The course will provide the student with a rigorous treatment of the qualitative theory of ordinary differential equations, and an introduction to the modern theory of dynamical systems and to elementary bifurcation theory. 3 cr, 3 lec. Prerequisites: MATH 2060U, MATH 3020U.

MATH 4020U Computational Science II (formerly Numerical Analysis). This course provides a variety of results and algorithms from a theoretical point of view. Students study numerical differentiation and integration; interpolation and approximation of functions; quadrature methods; numerical solution of ordinary differential equations; the algebraic eigenvalue problem. Computer software such as Maple and MatLab will be used in assignments. 3 cr, 3 lec. Prerequisites: MATH 1850U or MATH 2050U, MATH 2010U, MATH 2070U or MATH 2072U.

MATH 4030U Applied Functional Analysis. This course introduces the student to the modern theory of infinite-dimensional spaces and its applications. The main topics revolve around Banach and Hilbert spaces and their applications to Fourier series, differential and integral equations. The course will focus on developing intuition and building a catalog of examples of infinite-dimensional spaces. Moreover, the course introduces the very important notions of Lebesgue measure and Lebesgue integrals. Applications will play a major role in motivating the theory. 3 cr, 3 lec. Prerequisites: MATH 3020U, MATH 3060U.

MATH 4041U and MATH 4042U Topics in Applied Mathematics I and II. These courses cover various advanced topics that will enable the students to broaden their mathematical background and allow them to explore areas in which they have particular interest. Topics in Applied Mathematics I and II will both be the same in format but will cover a different selection of topics. The topics will be chosen according to the needs and demands of the students and the availability of instructors. 3 cr, 3 lec. Prerequisites: MATH 2072U or MATH 2070U, MATH 3050U, and at least one other 3000-level MATH course.

MATH 4050U Partial Differential Equations. This course considers advanced aspects of the theory, solution and physical interpretation of first and second order partial differential equations in up to 4 independent variables. This includes the classification of types of equations, and the theory and examples of associated boundary-value problems. The concepts of maximum principles and Green's functions are studied, as well as an introduction to nonlinear equations. A broad range of applications are considered. 3 cr, 3 lec. Prerequisites: MATH 3020U, MATH 3050U, MATH 3060U.

MATH 4060U Industrial Mathematics. A case-estudies approach is taken to the mathematical modelling of industrial problems and other physical problems that are relevant for industrial applications. Potential topics include: lubrication theory and slow viscous flow phenomena, elasticity, plasticity, crack propagation, chemical reactors and chemical kinetics, heat transfer, materials science modelling, stability theory and vibrations of machinery, semiconductor device modelling, electromagnetics and inverse problems, optimal design. For each topic covered, the modelling process of a specific example is followed from problem formulation to solution. Discrete, continuous, deterministic and stochastic models are used, as is a variety of solution techniques, both analytical and numerical. Both theoretical and practical issues will be considered. 3 cr, 3 lec. Prerequisites: MATH 3050U, MATH 3060U. Corequisite: MATH 3020U.

MATH 4400U Thesis Project. The thesis project provides students with the opportunity to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project may comprise an individual or group project, or an individual research project. Each student must write an individual thesis independently. 3 cr. Prerequisite: Completion of three years of mathematics specialization. Note: Students will carry out independent or group work under the guidance of individual mathematics professors.

MATH 4640U Operations Research. Continues the study of linear and nonlinear optimization problems and the concepts and techniques required for their solution. Students study: the theory of the simplex method; duality theory and sensitivity analysis; other algorithms for linear programming; topics in nonlinear programming; an unsolved problem from industry: modelling and algorithms. 3 cr, 3 lec. Prerequisite: MATH 3040U.

MLSC 1010U Introduction to Medical Laboratory Practice. A course designed to provide students with early socialization into the role of a medical laboratory scientist, which will include study of the role and scope of practice, career opportunities, and exposure to practitioners and agencies in related services. 3 cr, 2 lec, 2 lab. Prerequisites: BIOL 1010U, CHEM1010U.

MLSC 2111U Clinical Biochemistry I. Examines the theory, application and clinical significance of basic analytical procedures in the clinical chemistry laboratory. It encompasses basic metabolic biochemical pathways applicable to routine biochemical testing as well as common techniques and principles of photometry, electrochemistry, chromatography, osmometry, electrophoresis and immunochemistry. Manual, semi-automated and automated analyses are used to enforce basic laboratory practices of calibration, sample handling, result reporting

and basic quality control. 3 cr, 3 lec, 3 lab Prerequisites: MLSC 1010U, MATH 1880U, Corequisite: CHEM 2130U.

MLSC 2121U Clinical Hematology I. This course introduces fundamental knowledge and techniques used in the study of Hematology. Topics discussed include normal composition, production, metabolism, function and morphology of blood cells and hematopoietic organs. Current manual and automated laboratory procedures relating to blood cell structure, function and morphology are examined and applied and their significance in the diagnosis of blood disorders is emphasized. 3 cr, 3 lec, 3 lab. Prerequisites: HLSC 1201U, MLSC 1010U.

MLSC 2131U Clinical Microbiology I. This course provides fundamental microbiology and immunology knowledge with emphasis on prokaryotic cell structure, function and genetics, modes of action of antimicrobial agents and transfer of antimicrobial resistance; the immune response; etiology, pathogenesis, epidemiology, treatment and control of important infectious disease in humans. Laboratory exercises develop fundamental skills in aseptic technique, microscopy, pure culture study, antimicrobial susceptibility testing, and the isolation and identification of pathogenic microorganisms. This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and self-learning material. 3 cr, 3 lec, 6 lab. Prerequisites: HLSC 1201U, BIOL 1010U.

MLSC 3110U Clinical Biochemistry II. Clinical Biochemistry II builds on Clinical Biochemistry I to encourage an enhanced appreciation of the clinical and analytical aspects of biochemical diagnostic procedures related to major physiological systems, organs, and processes, including enzymes, lipids, carbohydrates, endocrinology, and renal and liver function. 3 cr, 1.5 lec, 3 lab. Prerequisite: MLSC 2110U. Corequisite: MLSC 3120U, MLSC 3130U.

MLSC 3111U Clinical Biochemistry II. Clinical Biochemistry II builds on Clinical Biochemistry I to encourage an enhanced appreciation of the clinical and analytical aspects of biochemical diagnostic procedures related to major physiological systems, organs, and processes, including enzymes, lipids, carbohydrates, endocrinology, and renal and liver function. It includes the clinical significance and methods of analysis for special biochemistry analytes such as hormones and metabolites, therapeutic drugs and toxicology, protein fractions, vitamins, and body fluid analyses. Automated and specialized lab procedures are performed along with method validation criteria and advanced quality control evaluation. 3 cr, 3 lec, 3 lab Prerequisites: MLSC 2111U, CHEM 2130U, Corequisite: HLSC 2461U.

MLSC 3120U - Clinical Hematology. Clinical hematology deals with the structure and function of blood cells and hematopoietic organs, as well as with principles and practices of coagulation studies. Current laboratory procedures relating to blood cell morphology, structure and function are examined and applied, and their significance in the diagnosis of blood disorders is emphasized. 3 cr, 1.5 lec, 3 lab. Corequisite: MLSC 3230U, MLSC 3130U.

MLSC 3121U Clinical Hematology II. This course expands on Hematology theory and practice with an emphasis on important blood disorders involving erythrocytes, leukocytes and platelets. Morphology, investigative procedures and laboratory findings related to blood disorders will be examined. The principles of hemostasis theory, including related disorders, will be studied. Common laboratory techniques used in the diagnosis of bleeding disorders will be applied and discussed. 3 cr, 3 lec, 3 lab. Prerequisite: MLSC 2121U, Corequisite: HLSC 2461U.

MLSC 3130U Clinical Microbiology. Clinical microbiology addresses the theory and methodologies involved in the laboratory diagnosis of bacterial, viral, fungal, and parasitic infections in humans. Included are discussions and/or practical activities related to specimen collection and processing, culture and sensitivity procedures, infection control, and the emerging global significance of infectious disease. 3 cr, 1.5 lec, 1.5 online lectrues and self-learining material, 3 lab. Prerequisite: BIOL 2830U. Corequisite: MLSC 3110U, MLSC 3120U.

MLSC 3131U Clinical Microbiology II. Clinical Microbiology II addresses the theory and methodologies involved in the laboratory diagnosis of bacterial, yeast and yeast-like infections in humans. An emphasis is placed on diagnosis of infectious agents relevant for each body system/anatomical site. Included are discussions and/or practical activities related to specimen collection and processing, culture

and sensitivity procedures, infection control, and the emerging global significance of infectious diseases. This course is offered in hybrid format, involving 1.5 lec, 1.5 online lectures and self-learning material. 3 cr, 7 lab. Prerequisites: MLSC 2131U, BIOL 2020U.

MLSC 3210U Laboratory Leadership and Quality Assurance. This course focuses on the specific knowledge and skills valuable in leadership, management and change management in the medical laboratory environment. Students examine and critique the principles and practices of quality assurance, information technology, economic protocols and laboratory accreditation. 3 cr, 3 lec. Prerequisites: HLSC 2030U, HLSC 380710U.

MLSC 3220U Transfusion Science. This course deals with the specific knowledge and skills needed for laboratory practice in blood transfusion procedures, including legal and regulatory requirements related to the Canadian blood system. Students practice the protocols and skills required for phlebotomy, and the collection and storage of blood. 3 cr,1.5 lec, 3 lab. Prerequisites: MLSC 2121U, BIOL 2020U. Corequisite: MLSC 3230U.

MLSC 3230U Histotechnology. This course integrates theoretical aspects of histopathology with practical elements of histotechnology to foster a familiarity with histological techniques required in the preparation and examination of tissue samples for pathology screening and diagnosis. 3 cr, 1.5 lec, 3 lab. Prerequisite: MLSC 2121U. Corequisite: MLSC 1010U.

MLSC 3300U Simulated Clinical Practicum. In this first phase of the clinical practicum, students experience specific basic aspects of laboratory and health care practice in both simulated and authentic workplace environments. These include activities related to phlebotomy, specimen handling, and core laboratory procedures. 3 cr. Prerequisites: HLSC 2461U, MLSC 3111U, MLSC 3121U, MLSC 3131U, MLSC 3220U, MLSC 3230U.

MLSC 4300U Clinical Practicum I. The second phase of the clinical practicum offers students a 13-week opportunity to work in a laboratory workplace setting and to acquire experience in the main disciplines of laboratory practice: chemistry, haematology, microbiology, histology, and transfusion science. 9 cr. Prerequisites: HLSC 2030U, MLSC 3210U, MLSC 3300U. Corequisite: MLSC 4400U.

MLSC 4301U Clinical Practicum II. The third phase of the clinical practicum allows students to continue to learn and experience the main disciplines of laboratory practice in a laboratory workplace setting. 9 cr. Prerequisite: MLSC 4300U.

MLSC 4400U Clinical Project I. Students work under the supervision of a faculty member to integrate and synthesize knowledge and experience gained throughout their program of study. This course requires the organization, implementation, and presentation of a research project in the student's area of interest. The project includes a significant analytical component and consideration of technical, economic, social or other significance of the findings. 3 cr. Prerequisite: HLSC 3910U. Corequisite: MLSC 4300U.

MLSC 4401U Clinical Project II. Students will continue to work on their clinical thesis project. The student should have completed the project focus, literature review, and the project proposal in semester one and the complete paper and class presentation will completed in semester two. 3 cr. Prerequisite: MLSC 4400U. Corequisite: MLSC 4301U.

NURS 0420U Professional Nursing - Bridging. Students will explore aspects of health and healing in the context of social, cultural, and spiritual diversity, values, beliefs, lifestyle choices, environment, and biophysical dimensions. The role and standards of practice for the registered nurse will be related to nursing knowledge, caring concepts and evidence based practice. Students will use reflective strategies to explore the meaning of lived caring experiences with examples from their own nursing practice and life experience. They will examine ways of caring as human beings and within the role of the registered nurse. 3 cr, 3 lec. Registration in this course is restricted to BScN students in the Practical Nursing and Registered Nursing advanced entry programs.

NURS 1002U Introduction to Nursing Praxis. This course gives the student the opportunity to apply theoretical concepts that relate to the maintenance and promotion of wellness. They will also explore the lived experience of individuals within families and in the community, using health and wellness as a focus. 3 cr, 3 lec. Corequisites: NURS 1003U, NURS 1100U.

NURS 1003U Foundations for Nursing Practicum I. The practice lab is the setting used to assist the nursing student in the acquisition of the knowledge and proficiency necessary for the competent performance of selected psychomotor skills. Students will observe, practice, research, review and critique fundamental nursing skills. 4 lab. Corequisite: NURS 1002U.

NURS 1100U Introduction to Health and Healing. This course introduces concepts that are the basis for nursing knowledge. Students will explore aspects of health and healing in the context of social and cultural diversity values, beliefs, lifestyle choices, environment, growth and development. The focus will be on maintenance and promotion of personal, individual, and family health and healing. 3 cr, 3 lec. Corequisite: NURS 1002U.

NURS 1150U Health and Healing - Older Adult. This course will provide the student with the opportunity to explore various health challenges in populations experiencing life transitions. The aging process and the health and healing requirements of the older adult are the focus of the theory concepts. The student learns key assessments and interventions to promote health and healing for individuals and families connected to this population. This course is an introduction to caring concepts, which are the basis for nursing care for the elderly population. 3 cr, 3 lec. Prerequisite: NURS 1100U. Corequisite: NURS 1505U.

NURS 1420U Development of Self as a Nurse I. This course is an introduction to nursing as a culture of caring. Beginning with a focus on self and then others, students explore the meaning of lived caring experiences. Students will explore ways of nursing as caring human beings and then within the role of the nurse. Students will explore multiple ways of knowing and critical thinking as aspects of caring. As students relate to the experience of becoming a nurse, they will be introduced to the evolution of nursing. 3 cr, 3 lec.

NURS 1503U Foundations for Nursing Practicum II. Building on skills learned in Nursing Praxis I the nursing student will continue in the acquisition of the knowledge and proficiency necessary for the competent performance of selected psychomotor skills. Students will observe, practise, research, review and critique fundamental nursing skills. Lab 4 hrs. Prerequisite: NURS 1003U. Corequisite: NURS1505U.

NURS 1505U Professional Practice II. This course will provide the student with the opportunity to explore the lived experience and health needs of the older adult within the health care setting. Practicum setting may include hospitals, continuing care facilities and homes for the aged". 3 cr. Prerequisites: NURS 1002U, NURS 1003U, NURS 1100U. Corequisites: NURS 1150U, NURS 1503U.

NURS 2007U Professional Practice III (Child and Family). In this practicum experience the student will provide nursing care for individuals and families experiencing health challenges during life transition. This experience will transition across the maternal child domain and include provision of nursing care during pregnancy, childbirth and the initial newborn phase. 3 cr. Prerequisites: HLSC 1201U, NURS 1150U, NURS 1505U. NURS 2320U. Corequisite: NURS 2100U.

NURS 2008U Professional Practice III (Adult Health Challenges). In this practicum experience the student will explore health challenges and nursing care of adults experiencing acute and/or chronic illness. Client health challenges in this practicum are more complex and may have a higher level of acuity and greater potential for negative outcomes. 3 cr. Prerequisites: HLSC 1201U, NURS 1150U, NURS 1505U, NURS 2320U. Corequisite: NURS 2150U.

NURS 2100U Health and Healing (Child and Family). The focus of this course is nursing science theory needed for the care of individuals and families experiencing health challenges that are related to child bearing and child rearing. Learners will use a collaborative process to study situations that illustrate selected health challenges facing the child bearing and child rearing population. 3 cr, 3 lec. Prerequisites: NURS 1150U, NURS 1505U. Corequisite: NURS 2007U or NURS 2507U.

NURS 2150U Health and Healing (Adult Health Challenges). The focus of this course is nursing science theory as it relates to care of adults experiencing health challenges such as acute or chronic illness. Learners will use a collaborative process to study situations that illustrate the challenges facing the popu-

lation experiencing acute or chronic illness. Current trends and best practices will be examined. 3 cr, 3 lec. Prerequisites: NURS 1150U, NURS 1505U. Corequisite: NURS 2008U or NURS 2508U.

NURS 2155U Health and Healing - RPN to BScN. This course provides the theoretical foundation to deliver safe and competent care for individuals and families experiencing health challenges during life transition. Learners will use a combination of case based learning, simulation and virtual learning through a collaborative process to apply the theoretical constructs in preparation for the practical environment. 3 cr. Corequisite: NURS 2506U.

NURS 2320U Health Assessment. This course is designed to provide the student with the cognitive, affective and psychomotor skills required to conduct a complete physical examination and health assessment of the client across the life cycle. Included are health history, physical examination, health promotion, and clinical assessment. Conceptual themes include holistic health practices, health promotion, client participation, cultural and diversity factors and developmental tasks. 3 cr, 1.5 lec, 2 lab. Prerequisite: HLSC 1200U. Corequisite: HLSC 1201U.

NURS 2506U Professional Practice Bridge. In this practicum experience the student will build on and strengthen their nursing skills in assessing, planning, implementing and evaluation a client centered plan of care. The main focus will involve caring for individuals and families experiencing health challenges during life transitions in the maternal child domain in a hospital environment. 3 cr. Prerequisite: NURS2320U. Corequisite: NURS2506U.

NURS 2507U Professional Practice IV (Child and Family). In this practicum experience the student will provide nursing care for individuals and families experiencing health challenges during life transition. This experience will transition across the maternal child domain and include provision of nursing care during pregnancy, childbirth, and the initial newborn phase. 3 cr. Prerequisites: NURS 2008U, NURS 2810U. Corequisite: 2100U.

NURS 2508U Professional Practice IV (Adult Health Challenges). In this practicum experience the student will explore health challenges and nursing care of adults experiencing acute and/or chronic illness. Client health challenges in this practicum are more complex and may have a higher level of acuity and greater potential for negative outcomes. 3 cr. Prerequisites: NURS 2007U, NURS 2810U. Corequisite: NURS 2150U.

NURS 2810U Pharmacology for Nurses. This course introduces the student to the concepts of pharmacology and medication administration. The student will learn about common drug classifications, and the psychological and cultural aspects of drug therapy. As well, the student will learn about the legal aspects, nursing responsibilities and decision-making processes required for the safe and accurate administration of medication to a variety of client populations. 3 cr, 3 lec. Prerequisites: HLSC 1201U or HLSC 2202U, NURS 1505U. Corequisite: HLSC 2460U.

NURS 3007U Professional Practice V (Healthy Communities). This course will critically examine the role of community health nurses in assessing, planning, implementing and evaluating health promotion strategies across the lifespan from a uniquely Canadian perspective. The student will learn to critically examine and apply community health nursing and allied health theory and concepts related to health promotion for a variety of nursing roles and community-based settings. The unique historical, political, legislative, cultural, and social factors that have shaped both the Canadian health care system and the role of the Canadian community health nurse will be critically examined. 3 cr. Prerequisites: NURS 2100U, NURS 2150U, NURS 2507U or NURS 2508U. Corequisite: NURS 3100U.

NURS 3008U Professional Practice V (Mental Health). This course provides the opportunity for the students with practicum experience in working with individuals and families in managing mental health issues. Students will have opportunities to practice nursing within hospital, out patient, and community mental health settings with clients across the age spectrum. 3 cr. Prerequisites: NURS 2100U, NURS 2150U, NURS 2507U or NURS 2508U. Corequisite: NURS 3150U.

NURS 3100U Health and Healing (Healthy Communities). This course will critically examine the role of community health nurses in assessing, planning, implementing and

evaluating health promotion strategies across the lifespan from a uniquely Canadian perspective. The student will learn to critically examine and apply community health nursing and allied health theory and concepts related to health promotion for a variety of nursing roles and community-based settings. The unique historical, political, legislative, cultural, and social factors that have shaped both the Canadian health care system and the role of the Canadian community health nurse will be critically examined. 3 cr, 3 lec. Prerequisites: NURS 2100U, NURS 2150U or NURS 2155U. Corequisite: NURS 3007U or NURS 3507U.

NURS 3150U Health and Healing (Mental Health). The focus of this course provides the theoretical foundations for understanding mental health issues in clients of all ages. It explores the impact of mental illness on the family, the major psychiatric disorders and the role of the nurse as a counsellor and therapist. 3 cr, 3 lec. Prerequisites: NURS 2100U, NURS 2150U. Corequisite: NURS 3008U or NURS 3508U.

NURS 3507U Professional Practice VI (Healthy Communities). This course will critically examine the role of community health nurses in assessing, planning, implementing and evaluating health promotion strategies across the lifespan from a uniquely Canadian perspective. The student will learn to critically examine and apply community health nursing and allied health theory and concepts related to health promotion for a variety of nursing roles and community based settings. The unique historical, political, legislative, cultural, and social factors that have shaped both the Canadian health care system and the role of the Canadian community health nurse will be critically examined. 3cr. Prerequisites: NURS 2506U or NURS 3150U, NURS 3008U. Corequisite: NURS 3150U.

NURS 3508U Professional Practice VI (Mental Health). This course provides the opportunity for the students with practicum experience in working with individuals and families in managing mental health issues. Students will have opportunities to practice nursing within hospital, out patient, and community mental health settings with clients across the age spectrum. 3 cr. Prerequisites: NURS 3100U, NURS 3007U. Corequisite: NURS 3150U.

NURS 4005U Professional Practice VII. This enrichment course provides the student with the opportunity of working with a select population of the students' choice. This practicum uses the preceptor model and may occur in a variety of settings. The student will complete a combination of mandatory simulation and negotiated practice time in their assigned setting in addition to participating in a series of client based learning seminars. This practicum uses the preceptor model and may occur in a variety of settings. 3 cr. Prerequisites: NURS 3100U, NURS 3150U, NURS 3507U or NURS 3508U, HLSC 2461U, HLSC 3910U. Corequisites: NURS 4100U, NURS 4420U.

NURS 4100U Nursing Leadership. This course focuses on the leadership and management roles of the nurse within the context of nurses' scope of practice, as defined by current legislation and professional standards and expectations. Emphasis is on nurses becoming effective members of health care as employees and future leaders and managers. Content will address leadership and management theories, organizational structure, planned change, conflict, organizational communication, problem solving, decision making, strategies for effective delegation, motivation, nursing care delivery approaches, and total quality management. 3 cr, 3 lec. Prerequisite: HLSC 3601U. Corequisites: NURS 4420U, NURS 4505U.

NURS 4420U Knowledge and Inquiry. This course focuses on nursing conceptual models as the basis for nursing practice. Select theories, including theories of caring, their philosophical foundations, concept analysis, synthesis and derivation will be explored. Students will work toward the integration of and critical reflection upon nursing theory, conceptual knowledge and practice (praxis). 3 cr, 3 lec. Prerequisite: HLSC 3601U. Corequisites: NURS 4100U, NURS 4505U.

NURS 4505U Professional Practice VIII. This provides the student with the opportunity to work and learn in a health care setting of the student's choice, based on individual learning needs, lifelong goals and program progression policy. This practicum uses the preceptor model and may occur in a variety of settings. Using a preceptor model the student has the opportunity to develop leadership and independence in her/his nursing practice and to

achieve competency level expected for nurses entering the profession. In this clinical placement students will be expected to complete a project that addresses the needs of the setting and disseminates that knowledge to peers. 9 cr. Prerequisites: NURS 4005U, NURS 4100U, NURS 4420U.

NURS 4507U Professional Practice RN to BScN. This course provides the student with the opportunity to work and learn in a health care setting of the student's choice, based on individual learning needs and lifelong learning goals. Concurrently with clinical practice the student will carry out or participate in a project relevant to the current clinical focus. The project will be planned in collaboration with preceptor colleagues and the professor. This course is restricted to students who entered in the RN to BScN stream. 6 cr. Prerequisites: NURS 3507U, NURS 4420U.

PHIL 1000U Philosophy: Social and Political Issues (formerly PHIL 1040U). This course provides a comprehensive assessment of classical and contemporary conceptions of justice. The focus will be on libertarian, socialist, liberal, democratic, communitarian, feminist, post-modern, and environmental views of justice. 3 cr, 3 lec.

PHIL 1010U Ethical Reasoning and Critical Thinking (formerly JSTS 1420U). This course focuses on ethical dilemmas faced by individuals as citizens and professionals. It helps students to clarify their values and establish a framework for ethical decision-making. It includes the concept of critical thinking or the ability to interpret complex ideas and appraise the evidence offered in support of an argument to better resolve problems or issues. Ethical issues, which relate to a wide variety of concerns, are examined. Students will examine a variety of professional ethical codes and apply ethical decision-making models to dilemmas in their personal and professional lives. 3 cr, 3 lec.

PHY 1010U Physics I. Introduction to basic mechanics. Newton's laws of motion; kinematics and dynamics in one and two dimensions; work and energy; friction; momentum and collisions; angular momentum, torque and rotation of rigid bodies; planetary motion; simple harmonic motion; static equilibrium; fluid mechanics. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisites: Advanced Functions and Introductory Calculus 4U or OAC Calculus (required); Physics 4U or OAC Physics (recommended). Notes: Students without the physics prerequisite will be responsible for making up background material. Credit restrictions: PHY 1030U, PHY 1810U.

PHY 1020U Physics II. Introduction to electromagnetism and optics. Electric charge and Coulomb's law; electric field, electric flux, Gauss' law; electrostatic potential, capacitance; Kirchoff's laws in DC circuits. Magnetic forces and magnetic field; Biot-Savart law; Ampere's law; magnetic flux, Faraday's law, inductance; AC circuits. Electromagnetic waves; wave propagation; waves in matter. Geometrical and wave optics. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: PHY 1010U. Credit restrictions: PHY 1040U, PHY 1810U.

PHY 1030U Physics for Biosciences I. This course introduces basic concepts of physics relevant to the biological sciences, in the areas of mechanics; vibrations and waves; properties of solids, liquids and gases; and heat. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: Advanced Functions and Introductory Calculus 4U or OAC Calculus (required); Physics 4U or OAC Physics (recommended). Credit restrictions: PHY 1010U, PHY 1810U. Note: Students without the physics prerequisite will be responsible for making up background material.

PHY 1040U Physics for Biosciences II. This course introduces basic concepts of physics relevant to the biological sciences, in the areas of electricity and magnetism; optics; sound and acoustics; nuclear physics and nuclear medicine. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisites: PHY 1010U or PHY 1030U. Credit restrictions: PHY 1020U, PHY 1810U.

PHY 1810U Physics for Health Science. This course provides some of the basic physics needed by health scientists. The topics covered are biomechanics, fluid mechanics, optics and electricity. 3 cr, 3 lec, 2 tut. Credit restrictions: PHY 1010U, PHY 1020U, PHY 1030U, PHY 1040U.

PHY 2010U Electricity and Magnetism I. This course provides the student with an introduction to the fundamental principles of classical electrodynamics. The course introduces: vectors in Cartesian, polar and cylindrical coordinates; scalar and vector fields; electric field, electric potential; Gauss' law; line and sur-

face integrals; gradient and divergence operators; Poisson's and Laplace's equations; dipoles, multipole expansions; capacitance; polarization, electric displacement and boundary conditions; DC circuit analysis; capacitors and RC transients; Lorentz force law; divergence and curl of the magnetic field in magnetostatics. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisites: PHY 1020U, MATH 1020U.

PHY 2020U Electricity and Magnetism II. PHY 2020U is a second course in electromagnetism. It continues to build a foundation in electricity and magnetism with discussions of electromotive force, electric currents and the continuity equation, motional electromotive force, electromagnetic induction and Faraday's law, the induced electric field, and energy in magnetic fields. Electrodynamics before and after Maxwell is presented along with further discussions of conservation laws, and the continuity equation. The course introduces Poynting's theorem, waves in one dimension, sinusoidal waves, boundary conditions, reflection and transmission and electromagnetic waves in a vacuum, and guided waves. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisite: PHY 2010U

PHY 2030U Mechanics I. Solving linear ODEs; one-dimensional motion; simple harmonic oscillator; two- and three-dimensional motion, including concepts of vector calculus; Newton's law of gravitation applied to celestial mechanics; special theory of relativity. Computational techniques for solving mechanics problems; error analysis and propagation of errors. 3 cr, 3 lec, 2 tut. Prerequisites: CSCI 1000U or ENGR 1200U, MATH 1020U, PHY 1010U.

PHY 2040U Mechanics II. Inertial and noninertial frames in Newtonian mechanics, rotating coordinate systems; dynamics of systems of particles, Hamilton's principle, Euler-Lagrange equation, Lagrangian for particles and systems; rigid body dynamics; static equilibrium. Nonlinear dynamics and deterministic chaos; comparison of nonlinear and linear systems; Poincaré surfaces, Lyapunov exponents, maps, flows and bifurcations, strongly irregular motion and ergodicity, regular and irregular motion in conservative systems. 3 cr, 3 lec, 2 tut. Prerequisite: PHY 2030U.

PHY 2050U Thermodynamics and Heat Transfer. Basic concepts of thermodynamics; the First and Second Laws; properties and behaviour of pure substances; ideal gases and mixtures; the equation of state for a perfect gas; Maxwell's relations; heat transfer by conduction, convection and radiation. 3 cr, 3 lec, 3 lab, 1 tut. Prerequisites: MATH 1020U, PHY 1020U. Credit restrictions: CHEM 2040U, CHEM 3140U, ENGR 2640U.

PHY 2060U Nuclear Physics and Relativity. After a brief introduction to Einstein's special theory of relativity, and in particular to the equivalence of mass and energy, the energy available from nuclear fission and fusion is examined in detail. Topics include radioactivity: alpha, beta and gamma decay, binding energy; nuclear fission: chain reactions, neutron density and flux; nuclear fusion: plasma reactors, temperature, density and time duration of plasmas. Different types of currently existing fission reactors, and the current state of research on fusion reactors, will be examined. 3 cr, 3 lec, 1 tut. Prerequisite: PHY 1020U. Credit restriction: ENGR 2500U.

PHY 3010U Statistical Mechanics I. The course introduces students to the statistical behaviour of physical systems with large numbers of particles and degrees of freedom. This course shows how macroscopic thermodynamics can be explained by a statistical treatment of microscopic interactions, both classical and quantum. The course will introduce the dynamical basis of temperature, entropy, chemical potential and other thermodynamic quantities. 3 cr, 3 lec. Prerequisites: PHY 2030U, PHY 2050U or CHEM 2040U.

PHY 3020U Quantum Mechanics I. This course explores the development of quantum theory and contrasts its underlying structure with classical physics. The probabilistic nature of quantum mechanics will be introduced to describe the wave-particle duality and the uncertainty principle, followed by the concept of wave function and the Shrödinger equation. Quantum principles will be applied to angular momentum and important standard problems such as potential well and barrier, harmonic oscillator and hydrogen atom. 3 cr, 3 lec. Prerequisites: PHY 2010U, MATH 1020U, MATH 2060U (recommended).

PHY 3030U Electronics. This course provides students with a strong understanding of electronic applications, starting with analysis of

DC, AC and transient electric circuits; operational amplifiers, feedback and op-amp circuits; digital electronics, logic circuits, Boolean Algebra, memories and counters. Semiconductor physics will be introduced, with applications to diodes, junction and field effect transistors, and FET and MOSFET amplifiers. 3 cr, 3 lec, 3 lab. Prerequisite: PHY 2010U.

PHY 3040U Mathematical Physics. Application of ordinary and partial differential equations to physical problems, including boundary and initial value problems associated with heat, wave and Laplace equations. This course will include Fourier analysis, and expansions in Bessel and Legendre functions. Problems will be solved with computers, using both algebraic and numerical methods. 3 cr, 3 lec. Prerequisite: MATH 2060U or MATH 2860U. Note: Students will benefit from taking MATH 3050U along with this course.

PHY 3050U Waves and Optics. Waves topics include: damped and forced oscillations; coupled oscillators and normal modes; traveling and standing waves; boundary conditions and energy transfer; dispersion. Optics topics include: geometrical optics: reflection, refraction and transmission of electromagnetic waves; interference; diffraction; applications of optics including optical imaging and processing, interferometers, lasers, fibre optics, and nonlinear optical devices. 3 cr, 3 lec, 3 lab. Prerequisite: PHY 2030U.

PHY 3060U Fluid Mechanics. Static properties of fluids; kinematics of fluids, conservation of mass and the continuity equation; dynamics of fluids, Euler's equation, Bernoulli's equation; the energy equation. Viscous fluids, laminar and turbulent flows, flow in pipes and fittings, the Moody diagram. Flows around immersed bodies; lift and drag. Boundary layers, flow separation, flow measurement techniques. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisites: MATH 1020U, PHY 1010U; MATH 2060U Differential Equations or MATH 2860U Differential Equations for Engineers is strongly recommended as a prerequisite. Credit restriction: ENGR 2860U.

PHY 4010U Statistical Mechanics II. Macro and microstates, statistical weight, Boltzmann and Gibbs distributions, partition and grand partition functions; microcanonical, canonical and grand canonical ensembles; statistical mechanics of isolated and interacting systems. Bose-Einstein and Fermi-Dirac statistics. Quantum statistics of ideal gases; blackbody radiation; paramagnetism in solids. 3 cr, 3 lec. Prerequisite: PHY 3010U.

PHY 4020U Quantum Mechanics II. Expands upon the concepts covered in the introductory course, with particular emphasis on applications to real systems. This course examines approximation methods including time-independent and dependent perturbation theory, variational methods, the WKB approximation and scattering theory. Mathematical computer programs will be used to solve problems. 3 cr, 3 lec, 2 tut (biweekly). Prerequisites: PHY 3020U.

PHY 4030U Modern Physics. This course introduces students to several important developments that have occurred in physics beyond the classical era. It deals with quantum properties of matter and covers three main topics: Atomic and Molecular Physics; Solid State Physics; and Quantum Optics and Lasers. A quantum-mechanical description is used to interpret the properties of multi-electron atoms, the concepts of atomic orbitals and the Zeeman, Stark and Auger effects. The course addresses the fundamental properties of the solid state, including crystal structure and its role in formation of the electron bands, and associated dynamical, structural, electrical and optical phenomena as well as their interplay (e.g., thermoelectric and piezoelectric effects). Finally, the field of quantum optics, lasers and their interaction with various materials is explored, including very recent advances in laser cooling, photonic bandgap systems and quantum computing. 3 cr, 3 lec, 3 lab (biweekly), 1 oth. Prerequisites: PHY 3010U, PHY 3020U, PHY 3040U.

PHY 4040U Solar Energy and Photovoltaics. This course describes the basic science and the practical devices for conversion of solar energy into electrical energy using the photovoltaic effect. Topics include an introduction to renewable energy and the benefits of photovoltaics; absorption of solar energy: the solar spectrum, air mass; band structure and optical properties of materials and principles of devices that are relevant to photovoltaics; thermodynamics of light conversion; solar cell technology; photovoltaic systems and system

economics. 3 cr, 3 lec, 3 lab (biweekly), 2 tut (biweekly). Prerequisites: PHY 3020U, PHY 3030U. Corequisite: PHY 3010U.

PHY 4050U Terrestrial-Based Energy Systems. The course starts with a brief review of energy in the Earth system, including hydro power, tidal and wave energy, heat pumps and geothermal energy, wind energy, solar and terrestrial radiation, global energy budget, global atmosphere and ocean structure and circulations, and the water cycle. More emphasis will be placed on wind power than other systems because wind is the most rapidly expanding renewable energy source at present. Students will study the economics, politics and social impacts of earth-based energy systems in Canada and globally, as well as the advantages of mixed systems (wind-hydro, winddiesel), public safety issues (dams and wind turbines), and environmental impact issues. 3 cr, 3 lec, 3 lab (biweekly). Prerequisites: ENVS 3020U, PHY 3060U.

PHY 4080U Hydrogen-Based Energy Systems and Fuel Cells. This course explores hydrogen as an energy carrier and its conversion in hydrogen fuel cells. The focus is on polymer electrolyte fuel cells but the course includes a brief discussion of phosphoric acid, alkaline, and solid oxide fuel cells as well as other types of fuel sources, such as methanol or natural gas. The thermodynamic aspects of a hydrogen economy are discussed, encompassing production (reforming, electrolysis), storage (compression, solid matrix), transportation and usage in fuel cells. With regards to fuel cells, the main focus will be on general operating principles, electrochemistry, thermodynamics (efficiency, losses), and mass and heat transport phenomena, including two-phase flow. A general picture of i) current scientific challenges and ii) device modelling of fuel cells will emerge. 3 cr, 3 lec. Prerequisites: CHEM 1020U, PHY 2050U, PHY3060U.

PHY 4100U Medical Imaging. The physical principles of the three main imaging modalities in current clinical practice, Magnetic Resonance Imaging (MRI), X-Ray Computed Tomography (CT), and Ultrasound (US) will be introduced from a medical physics perspective. Quantum mechanics and nuclear spin states for imaging will be compared and contrasted with image production via sound waves and X-rays. It will be shown how the different physical phenomena can be manipulated to generate clinically relevant images. The three modules of the course will entail a laboratory component, and extensive use of computer simulation and image analysis will be used. In addition, the current frontiers of medical imaging will be introduced. 3 cr, 3 lec, 2 lab. Prerequisites: PHY 3040U, PHY 3050U. Recommended: PHY 2060U or ENGR 2500U. Credit restriction: RADI 3200U.

PHY 4120U Forensic Physics Applications. This course introduces the student to forensic applications of physics, via the study of selected topics including ballistics, bloodstain analysis and motor vehicle collision reconstruction. Students will study the physics behind methods used to model crime events and will analyze evidence associated with these events using analytical instrumentation. 3 cr, 3 lec, 4 lab. Prerequisites: PHY 2030U, PHY 2050U, PHY 3060U, FSCI 3010.

PHY 4410U Physics Thesis Project I. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study and to satisfy specific objectives and requirements. The project will be selected to include research that has been approved by the supervising faculty member. Students will submit a progress report at the end the first semester. Once all work is completed, each student must submit a thesis and make a presentation based on their research in the following semester. 3 cr, 9 oth. Prerequisite: Students will have completed 90 credit hours in their area of specialization and be in clear standing, and must obtain prior consent of a faculty member. Note: Students are expected to take PHY 4420U in the following semester.

PHY 4420U Physics Thesis Project II. A continuation of the project started in PHY 4410U. Students will make presentations based on their research and submit a written thesis. 3 cr, 9 oth. Prerequisite PHY 4410U. Note: students are expected to take this course immediately after PHY 4410U.

PHY 4430U Directed Studies in Physics. This course requires independent research of a current topic in a specialized area of physics, including, but not restricted to, biophysics, computational, solid state, and modernapplied physics. The topic will be selected from the recent research literature and involve a

review and critical appraisal of underlying experimental principles. The course comprises independent library research, participation in weekly meetings, and written and oral presentations. 3 cr, 1 lec, 2 oth. Prerequisite: Students will have completed 90 credits in their area of specialization and be in clear standing. Note: Students are expected to take this course in one semester and a science elective as specified in the program map to complete the honours requirement.

PHY 4610U Biophysics of Excitable Cells. Provides a basic understanding of the physical phenomena underlying nerve and membrane activity and illustrates how these influence the structure and function of excitable cells. It will be demonstrated how neural processes are utilized in sensory processes, such as the eye and ear. 3 cr, 3 lec. Prerequisites: BIOL 1020U, PHY 1020U.

POSC 1000U Political Science (formerly POSC 1010U). This introductory course provides an introduction to the democratic system of government in Canada. It describes the organization of the three levels of government; federal, provincial and municipal. It introduces the political institutions and practices with emphasis on the constitution, parliament and cabinet. The interaction of each level and the democratic and legislative process is discussed. The course includes the services of each level of government and the impact on the justice system. 3 cr, 3 lec.

PSYC 1000U Introductory Psychology. This course introduces students to the vocabulary and principles of psychology. It also surveys the major theories and research related to the scientific study of human behaviour. Students will be encouraged to develop an understanding of the principles that underlie human behaviour. In addition, students will gain some insight into how and why people think, learn and behave. An attempt will be made to illustrate theory with practical examples, which are meaningful to students. The course examines the scientific process of research, physiology and perception, learning, memory and motivation, consciousness, stress, health, adjustment, and social psychology. 3 cr, 3 lec.

PSYC 2010U Developmental Psychology. This course is a comprehensive study of human development across the life-span from a developmental psychology perspective. The course examines developmental processes and milestones of the individual from conception through late adulthood, with particular emphasis on behavioural and cognitive development. Students will be introduced to the major psychological theories, theorists, and controversies in the field of human development. 3 cr, 3 lec. Prerequisite: PSYC 1000U.

RADI 2100U Radiological and Health Physics. This course is designed to teach the fundamental principles and numerical calculation aspects of health physics. Topics include atomic and nuclear structure, radioactivity, radiation interaction with materials, radiation dosimetry, biological effects of radiation, internal and external radiation protection, health physics instrumentation, criticality safety, radiation protection guidance criteria and protective measures. In addition, the student will learn the fundamentals of non-ionizing radiation protection (for example, laser safety). By the end of the course the student will understand the differences between the various types of radiation, how to detect the various forms of radiation, their biological interactions and effects, ways to reduce exposure (shielding distance, time), the ALARA principle (and derivatives) and how to perform exposure calculations. 3 cr, 3 lec, 2 tut (biweekly). Prerequisite: ENGR 2500U or PHY 2060U. Corequisite: RADI 2110U.

RADI 2110U Health Physics Laboratory. This course is designed to complement the course entitled Radiological and Health Physics. The intent of the course is to teach students how to properly utilize various items of health physics instrumentation. Included in this list are the broad categories of radiation survey equipment, laboratory analysis equipment, radiation dosimetry, air sampling, and personal protective equipment (PPE). In addition, the students will learn how to properly perform and record the QA associated with health physics measurements, with emphasis on medico-legal aspects of their measurements. 3 cr, 1 lec, 3 lab. Prerequisite: ENGR 2500U or PHY 2060U. Corequisite: RADI 2100U.

RADI 3200U Medical Imaging. The physical principles of imaging techniques with medical applications will be covered. It will be shown how the different physical phenomena can be manipulated to generate clinically relevant images. The following imaging modalities will be presented: Ultrasound, Planar X-ray,

Computed Tomography, Single-Photon Emission Tomography, Positron Emission Tomography and Magnetic Resonance Imaging. General image characteristics and basic image processing techniques will also be covered. Topics in wave physics, interaction of radiation with matter and medical radioisotope production will be covered as needed. 3 cr, 3 lec. Prerequisite: RADI 2100U or ENGR 2950U. Credit restriction: PHY 4100U

RADI 3530U Introduction to Radiological and Health Physics. This course provides an overview of the science and application of radiation in society and the practice of health physics. The course is delivered in the form of a series of modules presented by instructors actively engaged in the practice and research fundamental to the section topic and supported by industry and government scientists where possible. Section topics cover radiation protection in the nuclear power workplace; radiation and the environment; medical applications of radiation for diagnosis and therapy; health physics for non-proliferation of nuclear weapons and radiological event management; and industrial applications of radiation science. The importance of safety in general and some of the unique aspects of radiation safety in particular are emphasized. 3 cr, 3 lec.

RADI 3690U Radiation Chemistry and Processing. This course introduces students to work with radioactive materials, to determine the activities of such compounds and the parameters that affect the radioactivity of materials. The effects of various types and intensity of radiation on organic and inorganic materials, and on living organisms are studied. Students will consider beneficial changes to the properties of materials subjected to radiation, including the irradiation of food and other consumer products. 3 cr, 3 lec, 1 lab, 1 tut. Prerequisites: BIOL 2840U, CHEM 1020U, ENGR 2500U. Corequisite: ENGR 2220U.

RADI 4040U Material Analysis using Nuclear Techniques. This course concentrates on the application of radiation techniques to the analysis of materials, including the structure and composition of various objects. An important area of application is the detection of materials that represent a threat to security, safety, health and the environment. Topics studied include: principles, methodology; instrumentation and characteristics of nuclear analytical techniques; radiotracers; thermal and fast neutron activation techniques; prompt gamma radiation measurement techniques; measurement of gamma radiation from inelastic neutron collision; track-etch techniques; X-ray fluorescence techniques; radiometric analysis; activation analysis using neutrons, protons and photons; characterization of atmospheric particulates; measurement of heavy metal concentration in water and soil; cost-effectiveness of various non-destructive testing methods. 3 cr, 3 lec, 2 lab. Prerequisites: ENGR 2220U, ENGR 4430U.

RADI 4220U Radiation Biophysics and Dosimetry (formerly RADI 3220U) This course will concentrate on providing the biophysical basis for radiation effects and health risks and the implications for ionizing radiation dosimetry and radiation protection. The course will cover the following topics; the physics of the interaction of radiation with matter; radiation damage at the molecular, sub-cellular and cellular level; tissue damage and health effects in humans; radiation quality; regulatory requirements and radiation protection dosimetry. The primary goals are to teach students the fundamental mechanisms of radiation interactions at the molecular and cellular levels and the various biological endpoints that can result. Current concerns and controversy concerning the effects of low-dose exposures will also be covered in this course. 3 cr, 3 lec, 2 tut (biweekly). Prerequisites: BIOL 2840U, ENGR 2950U or (RADI 2100U, RADI 2110U).

RADI 4320U Therapeutic Applications of Radiation Techniques. A study of the uses of various types of radiation for therapeutic applications, including X-rays, gamma radiation, electrons, neutrons, lasers, UV, visible, infrared, radio-frequency, and microwaves. Topics include: production of radiation for therapeutic purposes; external beam radiotherapy, brachytherapy, electron beam therapy, boron neutron capture therapy, heavy ion therapy and photodynamic therapy; therapeutic dose calculation and measurement; dose calculation algorithms, treatment planning, optimization and verification; equipment calibration; dose impact on patients and workers; 3 cr, 3 lec, 2 lab. Prerequisites: BIOL 2840U, RADI 2100U.

RADI 4430U Industrial Applications of Radiation Techniques. An introduction to application of ionizing and non-ionizing radiation to industrial probing, gauging, imaging and monitoring. Topics include: monitors (smoke detectors, radon monitors), density gauging using alpha, beta and gamma radiation; thickness gauging using charged particles, photons and neutrons; fluid flow and void fraction measurements, element and content analysis using neutron activation analysis and fluoroscopic excitation, Mossbauer spectroscopy, industrial radiography and computed tomography using photons and neutrons; emission tomography, ultrasound and eddy current flaw detection. 3 cr, 3 lec, 2 lab. Prerequisites: RADI 4550U, ENGR 3740U.

RADI 4440U Radioisotopes and Radiation Machines. This course describes the various methods by which radiation can be produced (isotopic and electronic), and explains the operating principles, design and construction of machines utilizing radiation sources. An introduction to radioisotope production methods is given, along with the fundamentals of enrichment schemes. Design of machines that produce gamma, neutron, electron-beam, ion-beam, photon, laser and ultra-violet radiation are discussed. Specific aspects of radiation machines studied include the detectors used for high-energy radiation, low and high vacuum technology, high voltage power supplies, electron and ion beam generation, electron lens system, and the mechanisms of particle acceleration. Included in the discussion will be safety aspects regarding these machines. 3 cr, 3 lec, 2 lab (biweekly). Prerequisites: RADI 2100U or ENGR 2950U.

RADI 4550U Radiation Detection and Measurement (formerly RADI 3550U). In this course students learn how to measure radiation. They study the meaning and significance of the units for measuring radiation, the equipment that can be used to detect radiation, and the mathematical techniques used to interpret various detector readings. Topics covered include the nature and safe handling of radiation sources; measurement of source strength; the statistics of radiation counting; characteristics and utilization of various radiation detectors; radiation spectroscopy with scintillation detectors; semiconductor detectors; in-core and out-of-core neutron detectors; spectroscopy of fast neutrons; the application of radiation detectors and instrumentation; use of dosimeters; characteristics and utilization of radiation detectors devices needed for various radiation measurements; principles of nuclear instrument operation; factors considered to select nuclear instruments. 3 cr, 3 lec, 2 lab. Prerequisites: ENGR 2500U, ENGR 2950U or (RADI 2100U, RADI 2110U).

RADI 4995U Thesis Project I. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project topic will be selected to include some aspects of the student's specialization. Students will be required to organize and conduct a project with a significant analytical component, including consideration of technical, economic, environmental and other societal impacts. Thesis Project I will typically be a group project, but with each students having clearly defined roles, objectives and outcomes. The requirements include a written paper and a group presentation of the project outcomes. 3 cr, 1 lec, 4 lab, 1 tut. Prerequisite: Dean or dean's designates' permission. Students must have completed all courses up to and including third year and be in clear standing.

RADI 4999U Thesis Project II. The thesis project provides students with the opportunity, under the supervision of a faculty member, to integrate and synthesize knowledge gained throughout their program of study, to satisfy specific objectives and requirements. The project topic will be selected to include some aspects of the student's specialization. Students will be required to organize and conduct a project with a significant analytical component, including consideration of technical, economic, environmental and other societal impacts. Thesis Project II will typically be an individual research or design project, although with the approval of the professor, a significant and clearly delineated individual contribution to a group project is acceptable. The requirements include a written paper and an individual presentation of the project outcomes. 3 cr, 6 lab. Prerequisite: RADI 4995U and dean or dean's designates' permission.

SCIE 1900U Astronomy. An introduction to the origin, evolution and structure of the solar system; stars and stellar evolution; pulsars, black holes, quasars and cosmology. This course is designed primarily for non-science students. 3 cr, 3 lec.

SCIE 1910U Science in Context. A survey of selected topics from biology, chemistry, computing science, mathematics, and physics, and their significance in today's context. This course is designed for non-science students and cannot be used for credit towards a science degree. 3 cr, 3 lec.

SOCI 1000U Introductory Sociology. Sociology is the study of people and how they interact with each other and various social groups. This course deals with the study of people's lives, their relationship to society as a whole, and how people are affected by the society in which they live. The concepts, theories and methods of the discipline will be introduced and discussed with particular emphasis on the dynamics of Canadian society and Canadian social problems. 3 cr, 3 lec.

SSCI 1000U Introduction to Criminal Justice (formerly JSTS 1000U). This course provides an analysis of historical and contemporary theory and practices of the criminal justice system. Beginning with the analysis of crime data, the course will also examine the role and function of the each component of the criminal justice system: the police, the court system, corrections, prisons and alternatives to prisons. The course will also include a section on victimology, as well as sections on the criminal law, and theories of crime causation. 3 cr, 3 lec.

SSCI 1010U Introduction to Canadian Legal System (formerly JSTS 1260U). This course investigates the nature, purpose, scope, sources and basic principles of law within its historical and contemporary contexts. The historical and constitutional foundations of legal concepts and due process of law are studied. Current policy and legislation such as the legislative policy inherent in the Charter of Rights and Freedoms, federal and provincial human rights codes, family law, criminal law and civil law will be examined. Students will be guided to understand the complex interrelationship between the law and the various components of Canadian society. The roles of lawyers, judges and others involved in the integrated legal system will be presented. 3 cr, 3 lec.

SSCI 1200U Introduction to Social Policy. This is a core course in social policy analysis. Students will analyse a variety of social policy issues. The importance of both facts and values will be explored in the context of specific examples. Students will be introduced to the application of different types of the social science knowledge in social policy and administration in both the private and public sectors. The broad social structural development and context of the operation of social policy in modern Canadian society will be a focus. The role of the social policy analyst will be discussed in relation to different employment and consulting relationships in the private and public sector. 3 cr, 3 lec.

SSCI 1900U Computing for the Social Sciences. This is an introductory course in computing skills and computer programs used in the social sciences. Students will learn computer system and file management. They will also be exposed to SPSS and other quantitative data analysis programs as well as textual and qualitative data analysis programs, such as Qualrus and NUDIST. Online learning skills will also be covered including familiarization with learning managements systems, online reference tools, presentation packages, and web page authoring. 3 cr, 1.5 lec, 1.5 lab.

SSCI 2010U Criminal Law (formerly JSTS 1600U). This course investigates the nature, purpose, scope, sources and basic principles of law within its historical and contemporary contexts. The historical and constitutional foundations of legal concepts and due process of law are studied. Current policy and legislation such as the legislative policy inherent in the Criminal Code, the specific offences and categories in the Criminal Code, the Young Offenders Act, Narcotic Control Act will be examined. The roles of lawyers, judges and others involved in the integrated legal system will be presented. 3 cr, 3 lec. Prerequisite: SSCI 1010U.

SSCI 2011U Customs and Immigration Law (formerly JSTS 1610U). This course covers the role of Customs and Excise as a part of the Canada Customs and Revenue Agency mandate. Relevant legislation such as the Customs Act and the Narcotic Control Act are examined. Current issues surrounding customs policies as well as internal regulatory procedures (e.g., search and seizure, appeal procedures and citizens rights). Other issues covered are those that relate to the customs and immigration authority, such as primary duties and relevant sections of the Criminal Code. 3 cr, 3 lec. Prerequisite: SSCI 1010U.

SSCI 2020U Issues in Diversity (formerly JSTS 2190U). Students will identify and critically analyse issues of diversity. The course will incorporate an inclusive approach to diversity. Learners will focus on topics pertaining to the achievement of equity in various social settings, including but not limited to race, gender, ethnicity, class and social orientation. This course will deal with social and legal definitions of diversity and students will identify possible strategies for community empowerment. 3 cr, 3 lec. Prerequisite: SOCI 1000U or PSYC 1000U.

SSCI 2021U Issues in the Family (formerly JSTS 2490U). The purpose of this course is to introduce the student to problems in the family and their relation to the justice system. In addition to gaining knowledge of the theoretical perspectives used to study the family, the student will also lean about such issues as the relation between family and work, parenting, family interactions, and legal issues within the family. The legal issues to be discussed include family violence, divorce and remarriage, and the creation of social policies as they impact on the family. 3 cr, 3 lec. Prerequisite: SOCI 1000U or PSYC 1000U.

SSCI 2050U Rights and Freedoms in the Justice System (formerly JSTS 2640U). This course considers social and political theories, law and justice and their implications for policy development in the justice system (broadly defined). It explores the diverse nature of justice theory by focusing on modern and post-modern theories. The selected paradigms are studied with regard to their explanatory domain, role in examining social and legal problems and the development of justice policies. 3 cr, 3 lec. Prerequisite: SSCI 1000U or SSCI 1010U.

SSCI 2820U Psychological Explanations of Criminal Behaviour (formerly JSTS 2550U). This course examines the causes of criminal and deviant behaviour in terms of psychological theories and suppositions, including psychophysiological, psychoanalytic, behavioural, cognitive, and biological theories. The focus of the course is on similarities and differences across theories and research findings, and on the relationship between theories discussed and criminal justice policy. 3 cr, 3 lec. Prerequisite: PSYC 1000U.

SSCI 2830U Justice Theory and Policy (formerly JSTS 2040U). This course considers social and political theories, law and justice and their implications for policy development in the justice system. It explores the diverse nature of the theory within the field of crime and deviance by focusing on modern and post-modern theories. The selected paradigms are studied with regard to their explanatory domain, role in examining social and criminological problems and the development of policies. 3 cr, 3 lec. Prerequisites: SSCI 1000U or SSCI 1010U, SOCI 1000U or PSYC 1000U.

SSCI 2900U Research Methods (formerly JSTS 2900U). This course is designed as an introduction to research methods in criminology and the social sciences. The students will develop practical experience in a variety of research methods and techniques. Quantitative and qualitative research methods will be examined. They will gain experience in questionnaire design and analysis, interviewing skills, and focus group research. Statistical analysis will be introduced using computer software. Students may choose a research question from an area of professional interest. 3 cr, 3 lec, 2 lab. Prerequisites: SSCI 1900U, SOCI 1000U or PSYC 1000U.

SSCI 2910U Quantitative Methods (formerly JSTS 2820U). This course offers an introduction to quantitative research methods in criminology and social sciences. Topics to be included are: frequency distributions, measures of central tendency and variability, correlation and regression, elementary sampling theory and tests of significance. The application of statistical methods to the study of justice questions will be examined in depth with examples from the literature. Activities in this course are designed to build on those in the Research Methods course. 3 cr, 3 lec, 2 lab. Prerequisite: SSCI 2900U. Credit restrictions: BUSI 1450U, STAT 2010U, STAT 2020U, STAT 2800U, HLSC 3800U.

SSCI 2920U Qualitative and Case Study Research Methods. This course is an introduction to qualitative and case study research methods. Students will be exposed to a range of topics including: participant observation, discourse analysis, life histories, fieldwork protocols, grounded theorizing, interviewing, and comparative methods. Computer applications for qualitative analysis will be used extensively. 3 cr, 2 lec, 2 lab. Prerequisite: SSCI 2900U.

SSCI 2930U Geographic Information Systems. This course is an introduction to the use of geographic Information systems (GIS) in the social sciences. Students will work with a GIS software package and learn how to translate, input and display data. Multiple layer mapping and data analysis will be introduced. Some of the main applications of GIS in the social sciences will be demonstrated, such as: criminal activity mapping, social planning and community profiling. 3 cr, 2 lec, 2 lab. Prerequisite: SSCI 2900U.

SSCI 3010U Social Justice and Conflict (formerly JSTS 3520U). This course will examine justice from a social perspective by considering various cultural and ethnic groups experience with the law and the justice system (broadly defined). The multi-cultural make-up of Canadian society is considered in the domains of social and criminal justice. This stratification is analysed in relation to conflict in Canadian society. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3020U Corporate Crime. This course is designed to identify the nature and issues of corporate crime. It will conduct a critical analysis of the types of corporate crime including its associated with white collar crime. The course will review the classic studies on corporate crime beginning with the work of Sutherland and continuing to contemporary theories. The 274 course will also examine issues related to the control of white collar crime by both legal and non-legal means. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI2920U or SSIC 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3021U Cybercrime. This course is designed to identify the nature and issues of computer or cybercrime. It will examine the opportunities for cybercrime created by increase reliance on information technology. Specific topics might include cyberterrorism, creation and distribution of viruses, and hacking. It will also examine issues hacking as both a problem in need of control and a means of controlling cybercrime. 3 cr, 1.5 lec, 1.5 lab. Prerequisites: (two of SSCI 2900U or SSCI2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3022U Hate Crime. This course explores theoretical and practical issues related to understanding the policing and prosecution of hate crime and the types of legal structures that are used to control hate crime. It will examine the types of hate crime, such as those perpetrated against specific races, or those perpetrated on the basis of gender hatred, including gender orientation, and those that target victims on the basis of religion. It will also examine the types of people who engage in this type of crime. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3023U Domestic Violence. This course explores issues related to understand the nature and types of domestic violence. It explores the problems of child abuse, including child sexual abuse, spousal abuse, elder abuse and abuse found in alternative family structures such as gay and lesbian abuse, as well as stalking. The course will also examine societal and legal responses to family violence and explore issues related to the rights of victims of family violence. 3 cr, 1.5 lec, 1.5 lab. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3024U Criminal Gangs. This course examines the variety and extent of criminal gang activity. It will offer an analysis of the definitions of gangs, theoretical models used in the study of gangs, the social context that leads to gang formation, variations in gang structures and purposes, and various methods for controlling and policing gangs in Canada and elsewhere. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SCI 3025U Victimology (formerly JSTS 3460U). This course will examine the scope and impact of crime on victims as well as the experience of victimization as a whole. An historical review of the Victim's Rights Movement and the evolution of victims' rights in Canada will be studied. This course will take an integrated approach involving all components of the justice system (federal and provincial). 3 cr, 3 lec. Prerequisites: (two of

SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3026U Issues in Organized Crime (formerly JSTS 3650U). This course is designed to identify the nature and issues of organized crime in all societies. It will conduct a critical analysis of the types of organized crime including terrorism. This analysis will be grounded in theory and an applied research approach, which will emphasize a multi-disciplinary approach to identifying and recommending solutions to the problem. It will examine jurisdictional issues and begin to consider a multidisciplinary approach to the issue. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3027U Youth Crime (formerly JSTS 3670U). This course examines the nature, prevalence, characteristics, and consequences of youth crime in Canada. It considers the social, political, legal, and criminological issues associated with youth crime. Canada's juvenile justice and child protection systems are examined from an historical perspective. The Youth Criminal Justice Act is reviewed in detail in relation to the Convention of the Rights of the Child and various other international human rights standards. The objectives pursued by the youth criminal justice system are examined in relation to prevailing scientific and popular explanations of juvenile crime. The effectiveness of the youth justice system is evaluated for its effectiveness and efficiency. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3028U Women in the Criminal Justice System. This course examines issues impacting women in the criminal justice system. It examines a wide range of issues ranging from women as victims of crime, to women as criminal offenders, to women as police and other types of criminal justice workers. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3029U Understanding Recidivist Criminals. This course will explore theoretical and methodological issues related to understanding the scope and nature of recidivist criminals. The course will examine the sociological and psychological theories of recidivism, as well as problem of defining recidivism. It will also examine the most frequently cited typologies of recidivism criminals, and differences between the various types of recidivists. Specific types of recidivist criminals to be examined include drug users and traffickers, prostitutes and pimps, corporate criminals, burglars, career thieves, arsonists, and paedophilia. The methods used to detect and apprehend these criminals will also be discussed. 3 cr, 2 lec, 1 lab. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3030U Crime in Sport. This course will examine the connections between criminal activity and organized sports, both professional and amateur. Specific issues to be examined include the involvement of sports celebrities in illegal activities such as gambling and drug use, as well as other types of criminal activities ranging from rape and assault, to domestic violence. The purpose will be to put these activities in theoretical focus. 3 cr. Prerequisites: One of: SOCI 1000U or PSYC 1000U or POSC 1000U or PHIL 1000U or PHIL 1010U or SSCI 1000U.

SSCI 3040U Restorative Justice. This course examines the history, intent, and current practices in the development of restorative justice in Canada and elsewhere. It will examine the context giving rise to the development of restorative justice, theoretical developments, historical and present practices and the outcomes expected and achieved by restorative justice programs. 3 cr, 3 lec/sem. Prerequisite: (two of SSCI 2900U or SSCI2910U or SSCI 2920U or SSCI 2930U) and (two of SSCI2810U or SSCI 2820U or SSCI 2830U).

SSCI 3045U Terrorism. This course will explore theoretical and practical issues related to understanding the policing and prosecution of terrorism. It will begin with a discussion of problems in defining terrorism. It will also and review theoretical and methodological issues in the study of terrorism, as well as the social, political and economic roots of terrorism. The course will conclude with examination of strategies used in the control of terrorist activities around the world. 3 cr, 3 lec. Prerequisite: SSCI 3050U.

SSCI 3050U Policing (formerly JSTS 3020U). The goal of this course is to introduce students to the study of law enforcement in modern Canadian society. The course will address key issues and concerns that surround policing. Attention is given to the history of policing and to its public and private forms. Emphasis in the course will be placed on strategies, powers, and authority of contemporary policing; including decision-making, wrongdoing, accountability and the decentralization of policing. Special care is taken to assess the implications of the Charter of Rights and Freedoms on policing and police recruitment practices. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3051U Community Policing. This course examines the origins and development of community policing in Canada and internationally. It reviews the definition of community policing, and various models of policing and how community policing evolved from earlier models of policing. It examines how community policing meets the needs of contemporary society and how modern technologies influence policing methods and strategies. It will also analyse specific community policing projects in various Canadian communities as well as examples from other countries. 3 cr, 3 lec/sem. Prerequisite: SSCI 3050U.

SSCI 3052U Policing Diverse Communities. This course will explore issues related to policing racially diverse communities in Canada. It will explore the origins and manifestation of racism in policing, the use of police force, discretionary powers, the work of government appointment race and ethnic relations commissions, and police ethnic community relationships. Further, it will explore the concept of restorative justice within First Nations community policing, and its strengths. Of considerable relevance are related issues regarding the political and racialized economy of law enforcement, the primacy of ideology, law and legitimacy, and the links between state initiatives and cultural imperatives that constitute racially diverse forms of policing. Finally, we will explore the constitutional and political framework for policing, and the relevance of cultural differences between minority cultures and the assumed dominant culture in Canada. 3 cr, 2 lec, 1 lab. Prerequisite: SSCI 3050U.

SSCI 3053U Prosecution and Sentencing (formerly JSTS 3210U). This course will cover the historical evolution of the modern prosecution process and the theories and practices of judicial decision making. Analysis and cross-national comparisons of how criminal cases are processed through the court system will focus on the accountability of prosecutorial and judicial/court decision-making, and alternatives to the these decision making processes, including examination of appeal courts decision making and alternative or emerging paradigms for decision making. The course will also examine issues related to types of sentencing options available to judges including but not limited to sentences that include electronic monitoring, boot camps, the use of fines, probation orders, community service orders, and incarceration. Lab and simulations for evidence processes, prosecution and trial processes are included. 3 cr, 2 lec, 1 lab. Prerequisite: SSCI 3050U.

SSCI 3055U Security and Intelligence Policing. This examines issues and concerns about security and intelligence policing in democratic and non-democratic societies. It examines the theoretical and practical implications of developing the sophisticated policing methods used by security and intelligence police, and the problems these policing methods pose regarding the protection of civil rights and liberties. It will examine the types of security policing, ranging from military to civilian situations. A key component of the course will be the examination of the mechanism used to control this type of policing in both democratic and non-democratic societies. 3 cr, 3 lec. Prerequisite: SSCI 3050U.

SSCI 3060U Corrections (formerly JSTS 3710U). This course will present a historical view of the correction system and examine the current theories and practices used by Canadian corrections. The course will cover the following topics: sentencing, the incarceration process, probation, parole, institutional programs, social rehabilitation, offender case management, community-based offender programs, correctional workers, and community-based involvement in corrections. 3 cr, 3 lec. Prerequisites: (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), (two of SSCI 2810U or SSCI 2820U or SSCI 2830U).

SSCI 3061U Community Corrections. This course examines the origins and development of community corrections in Canada and internationally. It reviews the definition of community corrections, and various models of corrections and how community corrections evolved from earlier models of corrections. It examines how community corrections meets the needs of contemporary society and how modern technologies influence corrections methods and strategies. It will also analyse specific community corrections projects in various Canadian communities as well as examples from other countries. 3 cr, 3 lec/sem. Prerequisite: SSCI 3060U.

SSCI 3062U The Prison Experience. This course examines the prison experience from the inmate's perspective. It explores the inmate's orientation to being punished, including perceptions of alternative punishments, prison culture, relations with other inmates and prison staff, the impact of imprisonment on self esteem, issues of racism in the prison, and the inmate's perception of prison education, retraining and rehabilitation programs. 3 cr, 3 lec. Prerequisite: SSCI 3060U.

SSCI 3200U Public Administration (formerly JSTS 3780U). This course provides an analysis of organizational and policy theories and relates them to public administration in Canada. The administrative workings and the interaction of federal, provincial and municipal agencies are explored. Theories of policy making and the policy process in democratic governments are examined and applied to the Canadian context. 3 cr, 3 lec. Prerequisites: SSCI 2210U, (two of SSCI 2900U or SSCI 2910U or SSCI 2920U or SSCI 2930U), SSCI 2800U, SSCI 2801U.

SSCI 3910U Advanced Quantitative Methods. This is an advanced quantitative research methods. Students will explore quantitative techniques in the context of common research problems in the social sciences. There will be an emphasis on developing overall research strategies and protocols using quantitative methods. Computer applications for quantitative analysis will be used extensively. 3 cr, 2 lec, 2 lab. Prerequisite: SSCI 2910U.

SSCI 3920U Advanced Qualitative Methods. This is an advanced course in qualitative and case study research methods. Students will explore qualitative and case study issues in greater depth and apply their understanding to a few selected problems. There will be an emphasis on developing overall research strategies and protocols. Computer applications for qualitative analysis will be used extensively. 3 cr, 3 lec, 2 lab. Prerequisite: SSCI 2920U.

SSCI 3930U Advanced Geographic Information Systems. This is an advanced course in the use of geographic information systems (GIS) in the social sciences. Building on the introductory course in GIS students will develop complex models and consider how to integrate GIS displays with other forms of data analysis. The application of GIS in the social sciences will be further explored in a variety of substantive areas, such as criminal activity mapping, social planning and community profiling. 3 cr, 2 lec, 2 lab. Prerequisite: SSCI 2930U.

SSCI 4000U Advanced Justice Studies (formerly JSTS 4000U). This capstone course in justice studies will provide a critical examination of the theory and method of an integrated justice system in comparison with other countries' justice systems. Students will be expected to demonstrate an advanced level of understanding based on their previous course work of concept justice as it is found in common law systems, civic law systems, and socialist systems. The development, structure, and operation of other justice systems will be considered. The content will focus on the impact of historical, political, social, religious and cultural factors on the justice system. The specific components of each system will be evaluated for their structure and operation. 3 cr, 3 lec/sem. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4005U Independent Study. The course provides students with the opportunity to engage in in-depth study of a specific topic within the discipline. This will involve individual reading and scholarship at an advanced level under faculty supervision. Students will conduct an extensive literature review and write a major essay/critique of the relevant literature. Instructor and dean's consent required. Limited seats available. Prerequisite: fourth year standing with a cumulative 3.7 (A-) or greater GPA. 3 cr.

SSCI 4010U Policy Analysis in Justice Studies (formerly JSTS 4340U). This capstone course in the justice administration area explores various aspects of policy, planning and analysis as they relate to social policy and criminal justice policy. It will compare and contrast theories of policy implementation and analyse and evaluate social policies. Students will consider how economical, political, legal, and cultural forces shape the construction of social policy. Students will be expected to demonstrate an advanced level of understanding based on their previous course as it applies to the subject matter of this course. 3 cr, 3 lec/sem. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4020U Leadership and Administration (formerly JSTS 4580U). This course introduces students to the nature of organizations and the behaviour of individuals and groups within organizations. Students will assess and develop key knowledge and skills areas, which enable them to facilitate development of individuals, groups, and organizations. Students will be expected to demonstrate an advanced level of understanding based on their previous course work in leadership and administration. The knowledge and skills of this course will be applicable to a wide range of settings in the justice system. 3 cr, 3 lec/sem. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4031U Alternative Methods in Justice (formerly JSTS 4250U). This course will introduce students to methods of intervention applied in the justice field. It will use methods of problem solving to identify the appropriate intervention to solve the problem. Methods of intervention covered will include negotiation, mediation, arbitration, de-briefing, crisis/conflict management and group process facilitation. Simulation labs and activities are included. Students will be expected to demonstrate an advanced level of understanding based on their previous course work of concept justice as it is found in common law systems, civic law systems, and socialist systems. 3 cr, 3 lec/sem. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4032U Theory and Practice of Mediation (formerly JSTS 2370U). This course will examine the theory and practice of mediation in the justice field. It will consider the history and influences in the development of mediation practices. Mediation will be contrasted with formal litigation and other dispute resolution processes. Issues of social and legal control will be considered and critiques of the process from a feminist, Marxist and critical race theory perspective. Mediation practices and skills will be applied to contemporary issues and disputes. 3 cr, 3 lec/sem. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4050U Seminar on Police Ethics and Misconduct. This course will explore issues in ethical standards for police conduct and issues in the study of police misconduct. The case study method will be used to explore these issues. The course will examine such issues as the difference between accepting gifts and bribes, the use of excessive force, police involvement in criminal activity, and the regulation of police behaviour via civilian control. 3 cr, 3 lec/sem. Prerequisites: SSCI 3050U, fourth year standing in criminology and justice.

SSCI 4052U International Perspectives on Policing. This course provides insight on issues of policing and crime prevention around the world. It deals with policing practices in North America and compares these to practices in Europe and elsewhere including police practices in emerging democracies and those in transition from colonial status. It also deals with issues related to international practices in the implementation of community policing, policing global crime issues, including but not limited to issues connected with the drug trade, international prostitution, terrorism and criminal use of the internet. A key focus will be placed on issues associated with major political and social change, and the demand for more effective crime prevention. 3 cr, 3 lec/sem. Prerequisites: SSCI 3050U, fourth year standing in criminology and justice.

SSCI 4053U Police Management and Leadership. This course provides an analysis of organizational theories and relates them to police management, administration and leadership. The course will explore issues of labour relations in policing, stress management, leadership, financial management, organizational design, organizational change, organizational theory, external influences and controls on police policies and practices, and information

management. Students will assess and develop key knowledge and skills areas, which enable them to facilitate development of individuals, groups, and organizations. Students will also examine the issue of policy creation and analyse the problems of decision-making within police organizations. 3 cr, 3 lec/sem. Prerequisites: SSCI 3050U, fourth year standing in criminology and justice.

SSCI 4054U Crime Scene Investigation. This course is designed as an introduction to investigating crime scenes. It will begin with a discussion of such basics as the "crime scene kit," and conducting a search of the crime scene. It will then deal with the collection of evidence at different types of crime scenes, and the collection of impression evidence, and fingerprints. Other issues to be examines include documenting the crime scene, with written reports, photographs, sketches and videos. The course will also deal with presenting crime scene evidence in court. 3 cr, 3 lec/sem. Prerequisites: SSCI 3050U, fourth year standing in criminology and justice.

SSCI 4060U Seminar on Correctional Ethics and Misconduct. This course will explore issues in ethical standards governing the conduct of correctional workers. The case study method will be used to explore these issues. The course will examine such issues as the use of excessive force, involvement in smuggling contraband into correctional facilities, and the creation and implementation of codes of conduct for correctional services workers. 3 cr, 3 lec/sem. Prerequisites: SSCI 3060U, fourth year standing in criminology and justice.

SSCI 4062U International Perspectives on Corrections. The course examines corrections practices in Canada in comparison to practices in other countries. The course examines differences in legal structure, including policing methods, the courts, and correctional practices. It explores these topics, using to show the different ways policing, adjudication, and corrections can be carried out. 3 cr, 3 lec/sem. Prerequisites: SSCI 3060U, fourth year standing in criminology and justice.

SSCI 4063U Corrections Management and Leadership. This course has a focus on the problems and issues that arise in the management of correctional institutions. It provides an understanding of historical and contemporary correctional management practices, as well as an understanding of the roles and functions of correctional administrators. It also examines the theoretical underpinnings of correctional management and the practical concerns of implementation of correctional policies and investigates issues related to policy creation and decision-making within correctional institutions. Students will also assess and develop key knowledge and skills areas, which enable them to facilitate development of individuals, groups, and organizations. The course concludes with an examination of future prospects for change and innovation in corrections management. 3 cr, 3 lec/sem. Prerequisites: SSCI 3060U, fourth year standing in criminology and justice.

SSCI 4098U Criminology and Justice Field Work Practicum. The purpose of this work practicum is to allow the student to work in situations where they may be later employed. They will have the opportunity to practice skills gained in prerequisite courses and receive feedback on their abilities. Arrangements for placement of the student will be made with relevant agencies, in keeping with the learning goals of the student, and the program learning outcome requirements. The course includes seminars, one hundred hours of practical experience, and daily journals of the fieldwork experience that form the basis of a self- evaluation and report. Alternative forms of practicum placement will be possible where students can count volunteer or employment experience in the summer or at other times as part of their practicum. 3 cr. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4099U Criminology and Justice Integrating Project (formerly JSTS 4999U). This course is designed to allow students to participate in an upper level research seminar in criminology and justice. Emphasis will be placed on student participation in all aspects of the course. Student participation will include class presentations, class discussions, scheduled and routine meetings with the instructor and several written assignments that will contribute to the development of the research project. Students will be expected to demonstrate an advanced level of understanding based on their previous course work in this program. 3 cr, 3 sem. Prerequisite: Fourth year standing in criminology and justice.

SSCI 4101U Honours Thesis I. A specific scholarly project on a well-defined topic, to be determined in consultation with thesis supervisor. Honours Thesis I involves a literature review and the preparation of a thesis proposal for the intending project. Instructor and dean's consent required. Regular student/supervisor meetings will be scheduled. Prerequisite: fourth year standing with a minimum 3.7 cumulative GPA. 3 cr.

SSCI 4102U Honours Thesis II. A specific scholarly project on a well-defined topic, to be determined in consultation with thesis supervisor. Honours Thesis II is a continuation of Honours Thesis I. This course will required students to complete the project initiated in Honours Thesis I which will involve conducting research and writing a manuscript of publishable quality based on the findings of the research. Instructor and dean's consent required. Regular student/supervisor meetings will be scheduled. Prerequisites: SSCI 4101U Honours Thesis I with minimum A- and a minimum 3.7 cumulative GPA. 3cr.

STAT 2010U Statistics and Probability for Physical Science. This course introduces the concepts and techniques of statistics and probability to collect, present, analyse and interpret data, and make decisions in the presence of variability. Students study a selection of topics relevant to biological science, selected from: basic concepts of probability theory: events, sample spaces, probability; basic concepts of discrete mathematics: set theory, propositional logic, combinatorics; probability: marginal probability, conditional probability, independence, discrete and continuous random variables; probability distributions: binomial, Poisson, uniform, normal, etc.; mean and variance; the central limit theorem; statistical inference: estimation, significance tests, confidence intervals; introduction to experimental design; applications to quality control. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Credit restrictions: BUSI 1450U, SSCI 2910U, STAT 2020U, STAT 2800U, HLSC 3800U.

STAT 2020U Statistics and Probability for Biological Science. This course introduces the concepts and techniques of statistics and probability to collect, present, analyse and interpret data, and make decisions in the presence of variability. Students study a selection of topics relevant to biological science, selected from: basic concepts of probability theory: events, sample spaces, probability; basic concepts of discrete mathematics: set theory, propositional logic, combinatorics; probability: marginal probability, conditional probability, independence, discrete and continuous random variables; probability distributions: binomial, Poisson, uniform, normal, etc.; mean and variance; the central limit theorem; statistical inference: estimation, significance tests, confidence intervals; introduction to experimental design; applications to quality control. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Credit restrictions: BUSI 1450U, SSCI 2910U, STAT 2010U, STAT 2800U, HLSC 3800U.

STAT 2800U Statistics and Probability for Engineers. Sample spaces, probability, conditional probability, independence. Bayes' theorem, probability distributions, algebra of expected values, descriptive statistics. Inferences concerning means, variances, and proportions. Parameter estimation, correlation. Introduction to quality control and reliability. 3 cr, 3 lec, 1 tut. Prerequisite: MATH 1020U. Credit restrictions: BUSI 1450U, SSCI 2910U, STAT 2010U, STAT 2020U, HLSC 3800U.

STAT 3010U Biostatistics. Designed to help students understand and apply the commonly used advanced statistical methods to data that they are likely to encounter in their careers. The emphasis is on the design of research projects, data acquisition, analysis and interpretation of results. Topics to be covered include multiple regression, two factor ANOVA, logistic regression, nonparametric analysis, and re-sampling methods. 3 cr, 3 lec. Prerequisite: STAT 2010U or STAT 2020U.