Course Listings

220 Details of Courses

Courses taught at the University of Alberta are listed alphabetically. All courses, except those taught by Faculté Saint-Jean, are described in English.

Each course is designated by its computer abbreviation and a number. Students should use this abbreviation and number when completing any form requiring this information.

Courses are numbered according to the following system:

000-099	Pre-University
100-199	Basic Undergraduate. Normally requires no university-level prerequisites. Designed typically for students in the first year of a program.
200-299	Undergraduate. Prerequisites, if any, are normally at the 100-level. Designed typically for students in the second year of a program.
300-399	Undergraduate. Prerequisites, if any, are normally at the 200-level. Designed typically for students in the third year of a program.
400-499	Advanced Undergraduate. Prerequisites, if any, are normally at the 300-level. Designed typically for students in the fourth year of a program.
500-599	Graduate. Designated for graduate students and certain advanced or honors undergraduate students in their final year.
600-799	Graduate Courses
800-899	Special Registrations
900-999	Graduate Thesis and Project Numbers

For the purposes of program descriptions and prerequisite designation, courses numbered 100-199 are designated as Junior Courses and courses numbered 200-499 are designated as Senior Courses.

Note: Some exceptions to the course number system described above have been granted to the Faculty of Law and the Faculty of Medicine and Dentistry.

Course Description Symbols and Figures

Several symbols and figures are used to indicate the type, duration, and weight of courses.

(1) ★—Indicates "units of course weight," and usually follows the course title. The accompanying number indicates the weight of the course as used in computing grade point averages and for meeting degree requirements.

A course which runs throughout the Fall/Winter (i.e., from September through April) is usually weighted ★6. A course that runs for only one term (i.e., Fall: from September to December, or Winter: from January through April) is usually weighted ★3. Certain courses are offered over Fall/Winter or Spring/Summer, or in one term, with weights of ★1, ★2, and ★4. These are considered as one-sixth, one-third, and two-thirds of a Fall/Winter or Spring/Summer course, respectively. Some honors and graduate courses involving research may vary in weight according to the length and difficulty of the project. Some clinical courses may vary in weight according to the length of clinical experience. Some courses, not included in the computation of grade point averages, are offered for credit only and either carry a weight of ★0, or are marked as "Credit."

Undergraduate students who take courses offered by the Faculty of Engineering but are not registered in Engineering will have a course weight assigned for these courses according to the protocol of their home Faculty.

(2) *fi*—Denotes: "fee index," the value used to calculate the instructional fees for each course. The fee index is multiplied by the fee index value (given in the appropriate subsection of §22.2) to give the dollar value of instructional fees for the course.

For normal courses, the fee index is twice the value of the units of course weight; for example, a course with ★3 normally has *fi 6*. In cases where exceptional fees considerations need to be made, the fee index is set differently by the Board of Governors.

Note that certain programs (e.g. MD, DDS, etc.) are assessed on a program fee basis for all or certain years. In these cases, the fee index calculation does not apply.

(3) **(*x* term, a-b-c)**—These figures in parentheses give information on when the course is offered and the hours of instruction required by the course in a week, or in some cases the total time in a term.

In the case of a single-term course, the term in which the course is given is mentioned (item *x*). The designation "either term" means that the course may be offered either in the first term or in the second term or in each term, at the discretion of the department concerned. The designation "variable" means that the course may be taught either as a single-term or as a full-session course.

Item **a** indicates lecture hours. Item **b** indicates seminar hour(s), demonstration hours (d), clinic hours (c), or lecture-laboratory hours (L). Item **c** indicates laboratory hours. For two-term courses, the hours of instruction are the same in both terms unless otherwise indicated. The expression 3/2 means 3 hours of instruction every second week; 2s/2 means 2 seminar hours every second week.

Examples:

(first term, 3-0-3): a course taught in first term with 3 hours lecture, no seminar, and 3 hours lab per week.

(second term, 0-1s-2): a course taught in second term with no lectures, 1 seminar hour, and 2 hours of lab per week.

(either term, 3-0-0): a course taught in either first or second term, or each term, with 3 lecture hours per week, no seminar, and no lab.

(two-term, 3-0-3): a course taught over both first and second term with three lecture hours, no seminar, and three hours lab per week.

(variable, 3-0-0): a course which may be taught in either first or second term or over two terms with three lecture hours per week, no seminar, and no lab.

(4) **Prerequisite—** This provides information on courses which must be successfully completed before registering in the more advanced course.

Corequisite—This provides information on courses which must be taken before or at the same time as the course described in the listing.

Note: Departments are authorized to cancel the registration of those students registered in a course offered by the department if they do not meet the prerequisite and/or corequisite requirements stated in the course description in this Calendar.

(5) **[Department]—** This indicates the department responsible for registration for interdepartmental courses. Normally, courses will be credited to the discipline listed in the square brackets.

(6) **Open Studies Courses—** **O** indicates a course available to students of Open Studies. **L** indicates that a course is available to Open Studies students on a delayed registration basis only (see §210.2.2).

Important: Registration Procedures for Two-Term Courses

Students are strongly advised to refer to the Registration and Courses menu at www.registrar.ualberta.ca for details. Two-term courses are normally offered over two terms (either Fall/Winter or Spring/Summer). In a few instances, two-term courses are offered within a single term. In all cases these are identifiable in the Class Schedule because they consist of part A and part B (e.g., English 111A and 111B).

To successfully register in a two-term course, students, must do the following:

- register in both the part A and part B for all types of sections offered (Lectures, Labs, Seminars, etc.);
- register in the same section numbers for part A and part B of a course (e.g. Lecture A1 for both part A and part B, and Lab E3 for both part A and part B);
- register in all the appropriate sections on the same day.

All of the above must be done or the course registration is invalid and will be deleted. Invalid registrations will be deleted nightly. It is the student's responsibility to attempt the course registration again, subject to availability.

Example: A student wishes to register in ABCD 101, a two-term course. It has a lecture and a lab section. Based on the student's timetable planning, decides to take Lecture C3 and Lab C8. The student must add

In Fall Term ABCD 101A Lec C3 and ABCD 101A Lab C8,

and

In Winter Term ABCD 101B Lec C3 and ABCD 101B Lab C8.

All these sections must be added on the same day to successfully register. Otherwise the registration in ABCD 101 will be deleted overnight and the student's place in the course will be lost.

Course Renumbering

Over the years many courses have been renumbered. Old numbers can be found within individual course listings of previous Calendar editions.

Courses on Reserve

Courses not offered in the past four years are removed from this Calendar and placed on Reserve. These courses may be taught again in the future, in which case they would be brought back into the active Course Listings and placed in the Calendar. Information about Reserve Courses is available through the Registrar's Office, the University Secretariat, and Faculty Offices.

Faculty Specific Regulations Regarding Courses

For specific Faculty regulations relating to courses and for a complete list of subjects taught by a Faculty, please consult the Undergraduate Programs section of the Calendar at the end of each Faculty section.

Physical Requirements for University Courses

The University has a commitment to the education of all academically qualified students and special services are frequently provided on campus to assist disabled students.

Nevertheless, some courses make certain unavoidable demands on students with respect to the possession of a certain level of physical skill or ability if the academic objectives of the course are to be realized. In case of doubt, students are advised to contact the Department concerned and the Disabled Student Services Coordinator, Office of the Dean of Student Services.

Because support services cannot be guaranteed for all off-campus courses, instructors may be obliged to refuse registration in such courses.

Course Availability

The following is a comprehensive course listing of all the approved courses that the University of Alberta may offer. The appearance of a course in this list does not guarantee that the course will actually be offered. The most current information on courses is available on *Bear Tracks* at https://www.beartracks.ualberta.ca

221 Course Listings

221.1 Abroad, Study Term, ABROD

International Centre

Undergraduate Courses

ABROD 800 Study Term Abroad
★0 *(fi 0)* (either term, unassigned). This course is reserved for students who wish to maintain registration while participating in formal University of Alberta managed and approved Study Abroad programs. Students are registered in this course for each approved term of study abroad. The only fees assessed for this registration are the normal registration and transcript fees associated with the term. Students are eligible to register in the course on more than one occasion. Closed to web registration. Contact the International Centre.

221.2 Accounting, ACCTG

Department of Accounting and Management Information Systems
Faculty of Business

Notes
(1) Enrolment in all ACCTG courses, except ACCTG 300, is restricted to students registered in the Faculty of Business, or to students registered in specified programs that require Business courses to meet degree requirements and who have obtained prior approval of their Faculty.
(2) See also Management Information Systems listing.

Undergraduate Courses

ACCTG 300 Introduction to Accounting
★3 *(fi 6)* (either term, 3-0-0). Provides a basic understanding of accounting: how accounting numbers are generated, the meaning of accounting reports, and how to use accounting reports to make decisions. Note: Not open to students registered in the Faculty of Business. Not for credit in the Bachelor of Commerce Program.

ACCTG 311 Introduction to Accounting for Financial Performance
★3 *(fi 6)* (either term, 3-1.5s-0). How to prepare and interpret financial statements that report to decision makers external to the enterprise, such as shareholders and creditors. Course includes principles and standards of balance sheet valuation, income measurement, financial disclosure and cash flow analysis that link preparation and use of such statements. Prerequisites: ECON 101 and 102.

ACCTG 322 Introduction to Accounting for Management Decision Making
★3 *(fi 6)* (either term, 3-0-0). In contrast to the external orientation of ACCTG 311, this course focuses on how to prepare and use accounting information for management decision making. Major topics include: the role of corporate goals, planning and control concepts, how costs behave and how to analyze and manage them, budgeting and performance measures. Prerequisite: ACCTG 311.

ACCTG 412 Financial Reporting for Managers and Analysts
★3 *(fi 6)* (either term, 3-0-0). Course is for students who are not accounting majors and is especially useful for those contemplating a career in financial management or a CFA designation. It is for students who want to build on the financial accounting knowledge developed in ACCTG 311, and provides the necessary foundation for courses in financial statement analysis and tax. Further depth is provided in balance sheet valuation, income measurement, earnings per share and cash flow analysis. Prerequisite: ACCTG 311. Corequisite: FIN 301. Not open to students with credit in ACCTG 414 or 415.

ACCTG 414 Intermediate Financial Accounting I
★3 *(fi 6)* (either term, 3-0-0). First of two courses covering principles, methods and applications of current and proposed Generally Accepted Accounting Principles (GAAP). Emphasizes accounting for operating and investment assets, and related income measurement and disclosure. Prerequisites: ACCTG 311 and 322. Not open to students with credit in ACCTG 412. There is a consolidated exam for ACCTG 414.

ACCTG 415 Intermediate Financial Accounting II
★3 *(fi 6)* (either term, 3-0-0). Second of two courses (see ACCTG 414) covering principles, methods and applications of current and proposed Generally Accepted Accounting Principles (GAAP). Emphasizes accounting for financing, liabilities and equity, related income measurement and disclosure, and cash flow. Prerequisites: FIN 301, and a minimum grade of C- in ACCTG 414 or 412.

ACCTG 416 Accounting Theory and Current Issues
★3 *(fi 6)* (either term, 3-0-0). Major concepts and current issues in accounting thought are examined in an interactive setting. Topics include: the conceptual framework, standard-setting, concepts of income and value, accounting's role in capital markets and in contracts such as for lending and compensation, and recent and emerging issues related to financial and managerial accounting information. Prerequisites: ACCTG 414 or 412; FIN 301. Open only to fourth-year Business students, or by consent of the Department Chair. There is a consolidated exam for ACCTG 416.

ACCTG 418 Advanced Financial Accounting
★3 *(fi 6)* (either term, 3-0-0). The course analyzes the concepts and practices underlying financial reporting in more complex areas such as business combinations, multinational operations, future income taxes and not for profit organizations. Prerequisite: ACCTG 415. Open only to fourth-year Business students or by consent of the Department Chair.

ACCTG 424 Intermediate Management Accounting
★3 *(fi 6)* (either term, 3-0-0). Emphasizes mastery of techniques for implementation and evaluation of cost systems for management and decision making. Cost issues include: accumulating and analyzing costs using actual, standard and activity-based approaches, overhead allocation and cost estimation. Management topics include: pricing, production and investment decisions, revenue analysis, performance evaluation, management incentive systems and strategy analysis. Linear programming and multiple regression may be used. Prerequisites: ACCTG 322 and MGTSC 312. There is a consolidated exam for ACCTG 424.

ACCTG 426 Management Control Systems
★3 *(fi 6)* (either term, 3-0-0). Current research and cases in managerial accounting and control with a particular focus on strategy, governance and control processes in modern organizations. Topics include: control system design (including governance and audit), responsibility accounting, performance management, and strategic management accounting. Prerequisite: ACCTG 424. Open only to fourth year Business students, or by consent of Department Chair.

ACCTG 432 Financial Statement Analysis I
★3 *(fi 6)* (either term, 3-0-0). May be taken on its own or as the first of a two-course sequence that develops student competence in using financial information. Using case analysis, students learn to value a firm through the use of a five-step process: (1) examination of firm's industry, markets and strategy, (2) evaluation of firm's accounting policies and their impact on the financial reports, (3) applying fundamental analysis to assess financial strengths and weaknesses, (4) forecasting future earnings and cash flows, and (5) applying valuation models. Corequisites: ACCTG 415 or 412.

ACCTG 433 Financial Statement Analysis II
★3 *(fi 6)* (either term, 3-0-0). Second in a two-course sequence that develops student competence in the application of the tools of financial analysis. Topics include: evaluation of common rule-of-thumb valuation tools such as price to earnings and price to sales ratios in the light of more complete valuation models; analysis for credit and lending decisions; valuing high tech firms; forecasting quarterly and annual earnings; links between stock prices and earnings; using segment information; and other current issues. Prerequisite: ACCTG 432.

ACCTG 435 Information, Ethics and Society
★3 *(fi 6)* (either term, 3-0-0). For students in all majors who are interested in information and the roles it plays in business and society. Focus is on the nature and basic characteristics of information, and its importance in contemporary society, viewing information as a commodity that is produced, used, bought and sold. Two aspects of the ways in which information affects people are emphasized: (1) ethical issues relating to professions, businesses, government, and individuals;

(2) the impact of information technology and technological change on society. Prerequisites: ACCTG 311, 322, MIS 311. Open only to third or fourth year Business students, or by consent of the Department Chair.

ACCTG 436 Innovative Assurance Services, Independence and E-Commerce
★3 *(fi 6)* (either term, 3-0-0). Focuses on a broad array of assurance service topics, including: independence, methods of increasing the effectiveness of auditors, the nature of the accounting industry, e-commerce and security controls, and new assurance services. Prerequisites: ACCTG 311 and MIS 311.

ACCTG 437 Accounting Information Systems
★3 *(fi 6)* (either term, 3-0-0). An introduction to the field of computerized accounting information systems in organizations: basic transaction processing, record updating and maintenance, and financial and managerial reporting functions. Concentrates on the scope of accounting information systems in organizations; impacts of computerized accounting information systems on the role of the professional accountants; design issues for accounting information systems: security, accuracy, integrity, recovery, and operational control issues relating to accounting information systems; and impacts of computerized accounting information systems on the auditing processes in organizations. Prerequisites: ACCTG 311, 322, MIS 311. Credit may be granted for only one of ACCTG 437 or MIS 437.

ACCTG 442 International Accounting
★3 *(fi 6)* (either term, 3-0-0). How international business transactions are reflected in a company's financial statements, and how to manage international operations 'by the numbers.' Managers will develop the tools necessary to understand foreign partners'/competitors' financial statements. Prerequisites: ACCTG 311, 322.

ACCTG 456 Assurance on Financial Information
★3 *(fi 6)* (either term, 3-0-0). Focuses on the external auditor's provision of assurance services on financial information. Topics include: society's demand for various assurance services; the role, profession, ethics, independence and liability of the assurance provider; assurance risk and strategy; assurance planning, operations and reports; computerization and internal control; and emerging assurance services. Prerequisite: ACCTG 414 or 412.

ACCTG 462 Tax Planning for Managerial Decision Making
★3 *(fi 6)* (either term, 3-0-0). For students who are interested in how tax considerations affect business decisions and who want to be able to evaluate tax planning opportunities and strategies. Emphasis is on learning tax planning concepts, not on memorizing detailed tax rules. Provides students with a general framework for understanding the fundamental principles upon which effective tax strategies are based. Applications of this framework include financial and investment decisions, compensation planning, choice of organizational form, mergers and acquisitions, and international tax planning. Prerequisites: ACCTG 311, 322, and FIN 301.

ACCTG 467 Basic Income Tax
★3 *(fi 6)* (either term, 3-0-0). Examines the concepts, regulations and interpretations underlying individual and corporate income tax from the tax professional's perspective. Topics include: structure of the Income Tax Act, residency requirements, employment income, business and property income, capital gains, and the calculation of tax payable for individuals. Tax planning is introduced and opportunities for tax planning are identified where appropriate as topics are covered. Prerequisite: ACCTG 414 or 412.

ACCTG 468 Corporate Taxation
★3 *(fi 6)* (either term, 3-0-0). A study of the major tax concepts behind the specific provisions of the Income Tax Act in the taxation of corporations, corporate distributions and transactions between corporations and their shareholders. Emphasis on applying the Act in practical problems and case settings. Prerequisite: ACCTG 467.

ACCTG 480 Honors Essay in Accounting
★3 *(fi 6)* (second term, 3-0-0). Preparation of the Honors essay required for students in the Accounting Honors Program. Prerequisites: concent of the Department.

ACCTG 488 Selected Topics in Accounting
★3 *(fi 6)* (either term, 3-0-0). Acceptable as a Group A elective in the Major in Accounting. Normally restricted to third- and fourth-year Business students. Prerequisites: ACCTG 311, 322 or consent of Department. Additional prerequisites may be required.

ACCTG 489 Selected Topics in Accounting
★3 *(fi 6)* (either term, 3-0-0). Acceptable as a Group B elective in the Major in Accounting. Prerequisites: ACCTG 311 and 322.

ACCTG 490 Accounting Competition Part I
★1.5 *(fi 3)* (either term, 0-1.5s-0). Preparation for Student Competition in Accounting. May be considered as a Group A or Group B elective at the discretion of the Department. Prerequisite: consent of Instructor.

ACCTG 491 Accounting Competition Part II
★1.5 *(fi 3)* (either term, 0-1.5s-0). Completion of Student Competition in Accounting. May be considered as a Group A or Group B elective at the discretion of the Department. Prerequisite: ACCTG 490 and consent of Instructor.

ACCTG 495 Individual Research Project I
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. May be considered as a Group A or Group B elective at the discretion of the Department. Prerequisites: consent of Instructor and Assistant Dean, Undergraduate Program.

ACCTG 496 Individual Research Project II
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. Prerequisites: ACCTG 495, consent of the Instructor and Assistant Dean, Undergraduate Program.

ACCTG 497 Individual Research Project III
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. Prerequisites: ACCTG 496, consent of the Instructor and Assistant Dean, Undergraduate Program.

Graduate Courses

ACCTG 501 Introduction to Financial Reporting and Analysis
★3 *(fi 6)* (either term, 3-0-0). Accounting information's role in recording and reporting on economic and business events including the primary financial statements: balance sheet, income statement, and cash flow. Concepts and purposes underlying financial reporting. Selection of accounting policies and their informational effects for external users. The course begins to develop students' abilities to evaluate and interpret financial information through basic financial analysis.

ACCTG 523 Accounting Information and Internal Decision Making
★3 *(fi 6)* (either term, 3-0-0). Accounting concepts used by managers in planning and decision-making. The course introduces concepts of cost and profit behaviour, contribution margin, and activity-based costing, as well as relevant costs and revenues for production, marketing and capital budgeting decisions. The course also introduces students to the management planning and control system and its components - budgets, variance analysis, performance evaluation in centralized and decentralized organizations, and management compensation plans. The importance of designing a system to fit the organizations' strategy is emphasized. Prerequisite: ACCTG 501.

ACCTG 586 Selected Topics in Accounting
★1.5 *(fi 3)* (either term, 3-0-0). Topics in this seminar may vary from year to year and are chosen at the discretion of the Instructor.

ACCTG 610 Financial Reporting for Managers and Analysts
★3 *(fi 6)* (either term, 3-0-0). Intended for students who would like to build on the financial accounting knowledge developed in ACCTG 501, and is especially useful for those contemplating a career in financial management. Useful both as a stand-alone course and as a foundation for further study in financial statement analysis. Provides further depth in balance sheet valuation and income measurement in order to enhance students' ability to use financial accounting as a management tool. Prerequisite: ACCTG 501. Corequisite: FIN 501.

ACCTG 613 Financial Information and Capital Markets
★3 *(fi 6)* (either term, 3-0-0). Uses of financial information by consumers and the incentives that producers face. Prerequisite: ACCTG 501, FIN 501 and MGTSC 521.

ACCTG 614 Intermediate Financial Accounting I
★3 *(fi 6)* (either term, 3-0-0). First of two courses covering the theory, methods, strengths, and weaknesses of current Generally Accepted Accounting Principles (GAAP). Prerequisite: ACCTG 501.

ACCTG 615 Intermediate Financial Accounting II
★3 *(fi 6)* (either term, 3-0-0). Second of two courses covering theory, methods, strengths, and weaknesses of current Generally Accepted Accounting Principles (GAAP). Prerequisite: ACCTG 614.

ACCTG 616 Seminar in Financial Accounting Theory
★3 *(fi 6)* (either term, 3-0-0). The theory and propositions underlying current financial accounting practices and alternative theories of accounting measurement as proposed in the literature. The function of accounting in relation to the decision processes of the principal external users of accounting data is considered. Prerequisite: ACCTG 501.

ACCTG 618 Seminar in Advanced Accounting Issues
★3 *(fi 6)* (either term, 3-0-0). The application of accounting methods to incorporate investments and other advanced topics in financial reporting. Prerequisite: ACCTG 501.

ACCTG 624 Seminar in Management Accounting
★3 *(fi 6)* (either term, 3-0-0). Seminar consisting of topics concerned at an advanced level with generating and using accounting and related data in the planning and control functions of organizations. Prerequisite: ACCTG 523.

ACCTG 626 Seminar in Managerial Control
★3 *(fi 6)* (either term, 3-0-0). Current research and cases in managerial accounting. Prerequisite: ACCTG 523.

ACCTG 630 Financial Statement Analysis
★3 *(fi 6)* (either term, 3-0-0). Develops students' competence in analyzing financial

statements and using financial information to make investment decisions, both equity and debt. The primary thrust of the course is aimed at equity investments. Students learn a five step process of analysis for equity investments: (1) An examination of the firm's industry, markets and strategy, (2) An evaluation of the firm's accounting policies and their impact on the financial reports, (3) Applying fundamental analysis to assess financial strengths and weaknesses, (4) Forecasting future earnings and cash flows, and (5) Applying valuation models to assess the current price. A comparable process for lending decisions is then developed. Prerequisite: ACCTG 501. Corequisite: FIN 501.

ACCTG 656 Auditing History, Theory, and Current Thought
★3 *(fi 6)* (either term, 3-0-0). This course examines internal and external auditing history and philosophy, functional or operational auditing, and the nature of evidence, ethics, and independence. Prerequisite: ACCTG 501.

ACCTG 664 Tax Planning for Managerial Decision-Making
★3 *(fi 6)* (either term, 3-0-0). Tax considerations play a pervasive role in managerial decision-making. This course integrates tax planning into the bigger picture of business strategy. A microeconomics-based framework is developed for understanding how taxes affect business decisions and for evaluating tax-planning opportunities and strategies. The objectives are to learn the fundamental principles of effective tax planning and to become able to analyze the economic consequences of taxes in a wide variety of decision contexts, not to memorize detailed tax law. Applications include decisions involving investment, financing, compensation, personal financial planning, corporate reorganizations, and international business. Also examined are specific tax incentives for R & D and natural resource firms. Cases are used to illustrate how taxes affect actual business decisions and to explore how firms trade off potential tax savings against the non-tax costs of particular tax strategies. Prerequisites: ACCTG 523 and FIN 501.

ACCTG 686 Selected Topics in Accounting
★3 *(fi 6)* (either term, 3-0-0). Topics may vary from year to year and are chosen at the discretion of the instructor.

ACCTG 701 Introduction to Accounting Research
★3 *(fi 6)* (either term, 3-0-0). A survey/history of accounting thought, introducing the major research approaches in accounting. Open to all doctoral students or with written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 703 Accounting Research Workshop
★3 *(fi 6)* (two term, 3-0-0). Based on the Department's research workshop program, this course will discuss research methodology as it applies to accounting and ensure students learn how to review/evaluate current research and literature. Students are expected to present their own research and to analyse the research of others. This workshop is a single term course offered over two terms. Students are expected to attend regularly throughout their doctoral program, but register for credit in their second year (prior to taking accounting comprehensive examination).

ACCTG 704 Advanced Topics in Accounting Research
★3 *(fi 6)* (either term, 3-0-0). In-depth study of specific approaches to accounting research. The topic chosen will be based on the needs of students and the research interests of Faculty. The focus will be on developing students' ability to produce publishable research. A 704 course may actually comprise two, or even three, segments of related research. Students registered for a PhD in Accounting are required to register in at least two terms (two different topics).

ACCTG 705 Individual Research
★3 *(fi 6)* (either term, 3-0-0).

ACCTG 711 Seminar on Judgement and Decision Making Research in Accounting
★3 *(fi 6)* (either term, 3-0-0). Judgment and Decision Making research draws on theories in psychology, economics, statistics and cognitive science to examine issues in accounting and auditing. Reviews work on a range of issues such as accountability, fraud detection, accounting policy choice, the effect of discretion in accounting rules on decisions made by managers, investors and auditors, and how well auditors can assess the knowledge and/or preferences of other agents. Students may conduct an empirical study (e.g., an experiment, survey, simulation or case study) as part of the course. Some literature in behavioral finance and marketing may also be covered. Pre- or corequisite: MGTSC 705 (or equivalent). Open to all doctoral students or with the written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 721 Advanced Topics in Interdisciplinary Accounting
★3 *(fi 6)* (either term, 3-0-0). A specialist course on the conduct of interdisciplinary accounting research. Content will vary depending on the interests of students and faculty, but the emphasis will be on organizational, institutional, social, political or philosophical perspectives on accounting and auditing. Open to all doctoral students or with written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 722 Accounting Epistemology and Research Professionalism
★3 *(fi 6)* (either term, 3-0-0). Related to the research workshop series of the Department of Accounting and MIS and providing formal study of alternative accounting research methodologies. Will develop student's skills in presentations, and critically examine the social, political and ethical roles of an academic accountant. Students in the interdisciplinary accounting stream would be expected to attend this course each year they are in the program, but take it only once for credit. Open to all doctoral students or with written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 731 Economic Approaches to Accounting Research
★3 *(fi 6)* (either term, 3-0-0). Introduces accounting research topics and methods from the perspective of Financial Economics. Involves significant statistics, economics, and data processing. Focuses on the role of accounting information in market economies. Pre- or corequisite: MGTSC 705 or equivalent. Open to all doctoral students or with written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 732 Analytical Research in Accounting
★3 *(fi 6)* (either term, 3-0-0). Develops an information economics framework for understanding the role of accounting information in financial markets and in organizations. Involves significant microeconomics, game theory, and mathematics. Pre- or corequisite: ACCTG 731 or equivalent. Open to all doctoral students or with written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 733 Advanced Topics in Empirical Accounting Research
★3 *(fi 6)* (either term, 3-0-0). Intended to serve advanced doctoral students who have a specific interest in financial economics-based accounting research. Covers research design, implementation, and statistical issues in empirical accounting research. Pre- or corequisite: ACCTG 731 or equivalent. Open to all doctoral students or with written permission of the instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

ACCTG 820 Financial Accounting
★3 *(fi 32)* (first term, 3-0-0). Reporting of financial results of operations and financial positions to investors and managers; the use of accounting information for decision making. Restricted to Executive MBA students only.

ACCTG 830 Organization Planning and Control
★3 *(fi 32)* (second term, 3-0-0). Implementing financial performance measurement, evaluation and control systems, and organizational designs that enhance performance; understanding organizational structures and processes. Restricted to Executive MBA students only.

221.3 Administration, ADMI

Faculté Saint-Jean

Cours de 1er cycle

ADMI 301 Fondements légaux de l'économie canadienne
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Étude synoptique du système légal canadien, mettant l'accent sur les considérations sous-jacentes de politique sociale. Tout en considérant la nature, les sources, et la philosophie du droit, ainsi que les objectifs des politiques qu'il codifie, des sujets choisis dans les champs de la responsabilité civile délictuelle et contractuelle seront analysés. Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour B LAW 301.

ADMI 311 Introduction à la comptabilité
★3 *(fi 6)* (l'un ou l'autre semestre, 3-1.5s-0). Postulats, principes, cycle comptable, calcul du capital et du revenu, préparation et analyse d'un état financier, instance sur les rapports à présenter aux actionnaires et autres agents externes détenant des pouvoirs de décision. Préalable(s): ECONE 101/102. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour ACCTG 311.

ADMI 322 Gestion et méthodes de contrôle
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Objectifs d'une entreprise, concepts de planification et de contrôle, accumulation des coûts en vue de l'établissement des prix et de l'évaluation du prix de revient des produits. Préalable(s): ADMI 311 ou ACCTG 311. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour ACCTG 322.

ADMI 441 Stratégie d'entreprise
★3 *(fi 6)* (l'un ou l'autre semestre, 1.5-1.5s-0). Examine les décisions prises par les directions d'entreprises et met l'accent sur le développement de stratégies d'affaires et corporatives. Intègre les principes de gestion étudiés dans le tronc commun en administration des affaires, en utilisant des études de cas. Pourra inclure des invités de l'Université et du monde des affaires. Préalable(s): FIN 301, MARK 301, ORG A 201. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour ORG A 441.

ADMI 444 Commerce international
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Problèmes et opportunités lorsqu'une entreprise opère dans plus d'un pays: le choix à faire entre opérer à l'étranger, l'exportation et l'utilisation de licenses; nature et causes de l'émergence des nouveaux marchés de capitaux; institutions internationales facilitant le financement

de l'exportation; programmes de stabilisation des prix des produits de base; implications des politiques commerciales, fiscales et d'intégration pour les décisions d'entreprises; aspects de la gestion internationale, incluant la couverture contre le risque de fluctuation des taux de change, coûts de transfer et choix de structure de capital optimale. Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour BUEC 444.

ADMI 445 Stratégies concurrentielles en commerce international
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Le processus de conception et d'exécution de stratégies compétitives par des firmes opérant dans plusieurs pays ou globalement. Accent sur les cadres de stratégies concurrentielles, les formes changeantes de la compétition internationale, les niveaux d'analyse de la compétition internationale, la formulation et l'exécution de stratégies compétitives internationales. La matière est illustrée par des études de cas spéciaux de firmes canadiennes. Préalable(s): BUEC 311. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour BUEC 445.

ADMI 463 L'énergie et l'environnement: Structure industrielle, performance et défis
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Dans ce cours on utilise les outils de l'économique pour obtenir une meilleure compréhension des marchés et de l'industrie de l'énergie. Les différences et similarités entre les industries (pétrole, gaz naturel, électricité, etc.) et entre les différents segments (exploration, production, vente) sont expliquées. On y analyse les grands défis de l'industrie, entre autres la question environnementale et la mondialisation des marchés et les nouvelles formes de la concurrence. On verra comment cette transformation de l'industrie affectera les performances et stratégies de l'industrie. Préalable(s): ECONE 281 ou ECON 281 ou BUEC 311.

ADMI 479 L'entreprise et le gouvernement au Canada
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Analyse de l'interaction entre l'entreprise et l'administration publique. On s'intéresse en particulier à la dynamique d'ajustement de la firme et du gouvernement dans les changements d'environnement et de politiques. Les motivations et comportements des décideurs publics et des personnes responsables de l'application des mesures sont présentés dans le contexte d'interaction entre les différents groupes impliqués. Sont posées les bases d'une analyse de l'efficacité des différentes politiques, tant fiscales que réglementaires, visant la firme. On y aborde aussi les conséquences des changements de l'environnement économique, technologique et social pour la firme. Préalable(s): ECONE 281 ou BUEC 311. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour BUEC 479.

221.4 Agricultural and Resource Economics, AREC

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Notes
(1) Before 2003/2004, Agricultural and Resource Economics courses (AREC) were listed as Agricultural Economics (AG EC).
(2) See also Environmental and Conservation Sciences (ENCS), Forest Economics (FOREC), Interdisciplinary Undergraduate Courses (INT D) and Rural Sociology (R SOC) listings for related courses.

Undergraduate Courses

O AREC 200 Current Economic Issues for Agriculture and Food
★3 *(fi 6)* (either term, 3-0-0). Applications of economic principles to problems and current issues relating to agriculture, food and the environment. Prerequisite: ECON 101 or consent of Department. Credit will only be given for one of AREC 200 and AG EC 200.

O AREC 214 Applications of Linear Models to Food, Resources and the Environment
★3 *(fi 6)* (either term, 3-0-2). An introduction to methods and tools that are used to solve linear quantitative problems. Emphasis is on the use of these techniques for economic analysis in applications related to agriculture, food, forestry, and the environment. Classroom examples, laboratory assignments and computer tutorials are provided to give practice in applying quantitative tools to empirical problems. Prerequisite: Pure Mathematics 30. Credit will be granted for only one of AREC 214 and AG EC 316.

O AREC 313 Statistical Analysis
★3 *(fi 6)* (either term, 3-0-2). Analysis of economic data relating to renewable resource sectors including agriculture, food, forestry, and the environment; collection of data, sampling methods, tests of hypotheses, index numbers, analysis of variance, regression, and correlation; time series analysis. Prerequisite: Introductory statistics course. Credit will only be given for one of AREC 313 and AG EC 416.

O AREC 323 Introduction to Management for Agri-Food, Environmental, and Forestry Businesses
★3 *(fi 6)* (either term, 3-0-0). Principles and practical aspects of business management, and their relevance to the managing businesses involved in a variety of industries, including agriculture, environment, food, and forestry. Topics include business planning and organizing, and issues related to the management of financial, physical, and human resources. Prerequisite: ECON 101. Corequisite: ECON 102. Not open to students with prior credit in FIN 301 or MARK 301.

O AREC 333 Economics of Production and Resource Management
★3 *(fi 6)* (either term, 3-0-2). Application of economic concepts and introduction of management tools related to production decision-making for resource-based businesses. Integration of biophysical and environmental relationships with economic objectives in allocating resources. Introduction to quantitative tools used in applied production management decision-making. Prerequisites: One of AREC 200, AG EC 200, ECON 281, INT D 365 or AREC 365 or equivalent. Credit will only be given for one of AREC 333 and AG EC 333.

O AREC 365 Natural Resource Economics
★3 *(fi 6)* (either term, 3-0-0). Economics of natural resources; resource scarcity, conservation, sustainability, water resource issues, fisheries, forestry, agriculture, recycling, property and tenure institutions and public resource policy. Credit will be given for only one of AREC 365 and INT D 365. Prerequisite: ECON 101; ECON 102 recommended.

O AREC 384 Food Market Analysis
★3 *(fi 6)* (either term, 3-0-1). Applications of price and market theories to marketing problems and issues for food and agricultural products. Topics include: market structures and marketing functions; price analysis; futures markets; economics of food safety and quality; and international food marketing. Prerequisite: One of AREC 200, AG EC 200, ECON 281, INT D 365, or AREC 365 or equivalent. Credit will only be given for one of AREC 384 and AG EC 384.

O AREC 400 Special Topics
★3 *(fi 6)* (either term, 0-3s-0). Individual study of a selected topic or problem requiring both written and oral reports. Prerequisite: consent of the Department Chair.

AREC 410 Advanced Methods and Applications in Applied Economics
★3 *(fi 6)* (either term, 3-0-0). Empirical applications of methods used in resource, environmental, agri-food, and forest economics. Involves one or more case study projects that focus on the empirical examination of economic issues in renewable resource management. Requires payment of additional miscellaneous fees. Credit will be given for only one of AREC 410 and ENCS 410. Prerequisite: Open to fourth year students in Agricultural/Food Business Management, Agriculture (Agricultural and Resource Economics major), Environmental and Conservation Sciences (Environmental Economics and Policy major) and Forest Business Management programs, or by consent of Instructor.

AREC 423 Advanced Management Methods and Applications for Agri-Food, Environmental and Forestry Businesses
★3 *(fi 6)* (either term, 0-3s-0). Empirical applications of management and research methods used by business managers. Emphasis is given to integrating economic and business management concepts with applications to problems and issues in agriculture, food, the environment and forestry. Prerequisite: Open to fourth year students in Agricultural/Food Business Management, Agriculture (Agricultural and Resource Economics major), Environmental and Conservation Sciences (Environmental Economics and Policy major) and Forest Business Management programs, or by consent of Instructor. Credit will only be given for one of AREC 423 and AG EC 423.

O AREC 433 Financial Management in Resource Industries
★3 *(fi 6)* (either term, 3-0-0). Recent theoretical and empirical developments in finance are applied to natural resource industries including agribusiness, farming, forestry and food. Emphasis on capital budgeting, financial risk, and associated topics for long run investment planning in smaller business enterprises. Prerequisite: One of AREC 200, AG EC 200, ECON 281, INT D 365 or AREC 365, FIN 301 or equivalent. Credit will only be given for one of AREC 433 and AG EC 433.

O AREC 450 Economic and Social Impact Assessment
★3 *(fi 6)* (either term, 3-0-0). Examination of the theory and application of economic and social impact assessment methods with a focus on the evaluation of environmental and natural resource regulatory policy and planning. Includes a series of case studies of recent environmental policy proposals to illustrate the methods used to evaluate economic benefits and costs as well as the social and cultural impacts of such proposals. Prerequisite: one of AREC 200, 365, R SOC 355, or equivalent, or consent of Instructor. Credit will only be given for one of AREC 450 and 550.

AREC 465 Advanced Natural Resource Economics
★3 *(fi 6)* (either term, 3-0-0). Applied economic modeling of renewable resource utilization and environmental issues with a focus in forestry and agriculture. Topics may include current Canadian and international issues in the area of environmental valuation, energy, climate change, biodiversity and conservation as related to Forestry and Agriculture. Prerequisite: AREC 365 or permission of Instructor; (AG EC 416 or AREC 313) and ECON 281 recommended. Credit will be given for only one of AREC 465 and INT D 465.

O AREC 473 Food and Agricultural Policies
★3 *(fi 6)* (either term, 3-0-0). Economics of public policy for agriculture and food industries. Public choice principles and institutions. Farm and food policy in

Canada and selected countries. Case studies on price and output policy; agricultural trade; food safety and quality; resource use and environmental sustainability; and/or rural change/restructuring. Prerequisite: One of AREC 200, AG EC 200, ECON 281, INT D 365 or AREC 365 or equivalent. Credit will only be given for one of AREC 473 and AG EC 473.

O AREC 475 World Food and Agriculture
★3 *(fi 6)* (either term, 3-0-0). Economic issues in international agriculture including the world food problem, agricultural development; agricultural and food trade and policy and selected agricultural biotechnology issues. Both Canadian and international applications and issues are stressed. Prerequisite: One of AREC 200, AG EC 200, ECON 281 or consent of Department. Credit will only be given for one of INT D 303, AREC 475 and AG EC 475.

O AREC 482 Cooperatives and Alternative Business Institutions
★3 *(fi 6)* (either term, 3-0-0). The impact of agri-food and resource market structures on market conduct and performance; the impact of market structure on selection of cooperative versus investor owned firms including differences in firm objectives, performance and management incentives; topics may also include effects of firm type on community development and policy formation. Prerequisite: one of AREC 200, AG EC 200, ECON 281, INT D 365 or AREC 365 or equivalent. Credit will only be given for one of AREC 482 and AG EC 482.

O AREC 484 Strategic Management in Resource Businesses
★3 *(fi 6)* (either term, 3-0-0). Analysis of strategic management concepts and applications to agri-food and resource industries. The development of business and corporate strategies including competitive positioning; sustaining competitive advantage; vertical coordination and strategic alliances in value chains; corporate diversification and global business strategy. Prerequisite: One of AREC 200, AREC 323, AG EC 200, AG EC 323, ECON 281, INT D 365 or AREC 365 or equivalent. Credit will only be given for one of AREC 484 and AG EC 484.

O AREC 485 Trade and Globalization in Food and Resources
★3 *(fi 6)* (either term, 3-0-0). Principles and policies affecting international trade in food, forestry and natural resources. Current issues in trade, including fair trade concerns, trade in capital and services, effects of food safety and quality standards, and environmental issues surrounding trade agreements and institutions. Prerequisite: One of AREC 200, AG EC 200, INT D 365 or AREC 365, R SOC 355 or equivalent. Credit will only be given for one of AREC 485 and AG EC 485.

O AREC 487 Managing Market Risk in Resource Industries
★3 *(fi 6)* (either term, 3-0-0). Study of the mechanics and economic functions of commodity futures and options derivative markets. Topics include the theory and practice of hedging, price formation and issues unique to commodities. Emphasis on concepts and analysis to evaluate derivative markets; use of derivatives to manage market risk in agribusiness, forestry and other resource businesses. Prerequisite: One of AREC 333, AREC 384, AG EC 333, AG EC 384, ECON 281, FIN 301, or equivalent. Credit will only be given for one of AREC 487 and AG EC 487.

Graduate Courses

Notes
(1) See also INT D 565 for a course offered by more than one Department or Faculty and which may be taken as an option or as a course.
(2) Undergraduate AREC courses at the 400 level may be taken for credit by graduate students in Rural Economy.

AREC 500 Research Projects in Agricultural Economics
★3 *(fi 6)* (either term, 0-3s-0). Individual study. Investigations of a special problem involving field or library study and preparation of written reports. Prerequisite: consent of Department Chair.

O AREC 502 Applied Demand Analysis
★3 *(fi 6)* (either term, 3-0-0). Principles of consumer demand analysis including theoretical and empirical approaches to the analysis of consumer choice. Applications include food demand analysis, analysis of consumer choice under uncertainty (food safety, nutrition, health), dynamic consumer choice, advertising and consumer choice, preference shifts in consumer choice, and economic welfare measurement. Prerequisite: ECON 481. Credit will only be given for one of AREC 502 and AG EC 502.

O AREC 513 Econometric Applications
★3 *(fi 6)* (either term, 3-0-3). Econometric theory, multiple linear regression analysis and interpretation, simultaneous equation estimation, qualitative choice models, time series analysis, applications of econometric techniques to resource and agricultural economic problems. Prerequisite: Intermediate course in statistics or econometrics. Credit will only be given for one of AREC 513 and AG EC 513.

O AREC 514 Quantitative Techniques
★3 *(fi 6)* (either term, 3-0-3). Selected applications of econometrics, operations research, and mathematical programming to economic problems in resource, agriculture, forestry, and food sectors. Prerequisite: consent of Instructor. Credit will only be given for one of AREC 514 and AG EC 514.

O AREC 533 Production Economics
★3 *(fi 6)* (either term, 3-0-3). Static and dynamic firm theory, production principles applied to resource use, resource and product combination, cost structure, uncertainty and expectations. Prerequisite: consent of Instructor; (AREC 313 or AG EC 416) and (AREC 502 or AG EC 502) recommended. Credit will only be given for one of AREC 533 and AG EC 533.

O AREC 534 Agricultural Finance
★3 *(fi 6)* (either term, 3-0-0). Advanced capital budgeting and financing issues relating to farms and small businesses. Risk measurement and management. Agency and information problems and the relation between farm and small business investment and security markets. Cost of capital and valuation of farm and small business assets. Financing alternatives and the choice between them. Evaluation of public programs which affect agricultural and small business financing and risk control. Prerequisites: consent of Instructor; (AREC 313 or AG EC 416) and (AREC 433, AG EC 433 or FIN 301) recommended. Credit will only be given for one of AREC 534 and AG EC 534.

O AREC 550 Economic and Social Impact Assessment
★3 *(fi 6)* (either term, 3-0-0). Examination of the theory and application of economic and social impact assessment methods with a focus on the evaluation of environmental and natural resource regulatory policy and planning. Includes a series of case studies of recent environmental policy proposals to illustrate the methods used to evaluate economic benefits and costs as well as the social and cultural impacts of such proposals. Prerequisite: one of AREC 200, 365, R SOC 355, or equivalent, or consent of Instructor. Credit will only be given for one of AREC 450 and 550.

O AREC 569 Advanced Topics in Natural Resource and Environmental Economics
★3 *(fi 6)* (either term, 3-0-0). Theoretical analysis and modeling of renewable resource and environmental issues at local and global levels. Includes analysis of international environmental issues, the effect of economic growth on the environment, sustainable development, and local and global commons management. Prerequisite: ECON 481 or consent of Department. Credit will only be given for one of AREC 569 and AG EC 569.

O AREC 573 Agricultural Economics Policy
★3 *(fi 6)* (either term, 3-0-0). Goals and instruments of agricultural policy, model constructions with decision and control criteria; national, regional, and provincial agricultural application. Prerequisite: consent of Instructor; (AREC 313 or AG EC 416) and (AREC 502 or AG EC 502) recommended. Credit will only be given for one of AREC 573 and AG EC 573.

O AREC 575 Agriculture in Developing Countries
★3 *(fi 6)* (either term, 3-0-0). Role of agriculture in the economic growth of developing countries; influence of international trade and commodity agreements on economic development. Prerequisite: consent of Instructor; (AREC 475 or AG EC 475) and (AREC 502 or AG EC 502) recommended. Credit will only be given for one of AREC 575 and AG EC 575.

O AREC 584 Marketing Economics
★3 *(fi 6)* (either term, 3-0-0). Microeconomic theory and analysis of markets for agricultural and food products. Topics will vary with the evolution of the literature but may include alternative market structures, market regulation, empirical price analysis, advertising, location theories, the role of information in markets, the role of uncertainty in markets, and organization structures. Prerequisite: consent of Instructor. (AREC 313 or AG EC 416) and (AREC 502 or AG EC 502) recommended. Credit will only be given for one of AREC 584 and AG EC 584.

O AREC 585 Agricultural Trade
★3 *(fi 6)* (either term, 3-0-0). Concepts and principles underlying international trade and specialization applied to agricultural and food products. Protection and its economic impacts. Agricultural trade policy, institutions and agreements. The role of agricultural trade in developed and less developed countries. Analysis of imperfect markets and alternative approaches to trade liberalization. Prerequisite: consent of Instructor. Credit will only be given for one of AREC 585 and AG EC 585.

AREC 600 Directed Studies
★3 *(fi 6)* (either term, 0-3s-0). Analysis of selected research problems and design of research projects in production economics, natural resource economics, or marketing economics. Prerequisite: consent of Department Chair.

AREC 900 Directed Research Project
★3 *(fi 6)* (variable, unassigned). Credit will only be given for one of AREC 900 and AG EC 900.

221.5 Agricultural, Food and Nutritional Science, AFNS

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Note: See also Animal Science (AN SC), Environmental and Conservation Sciences (ENCS), Interdisciplinary (INT D), Nutrition (NUTR), Nutrition and Food Science (NU FS), Plant Science (PL SC), Renewable Resources (REN R) and Soil Science (SOILS) for related courses.

Undergraduate Courses

O AFNS 450 Compost Science and Technology
★3 *(fi 6)* (first term, 3-0-3). Biological, chemical and physical interactions involved in composting of organic materials. Selection of appropriate technologies. Design, management, and economics of composting facilities. Graduate students may not register for credit (see AFNS 550). Credit will only be given for one of AFNS 550 and 450. Prerequisites: ★3 BIOL and (★3 PHYS or CHEM or equivalent).

Graduate Courses

Note: Prerequisites are shown to provide an indication of the background that is expected for these courses. Students not having the prerequisites for a course are encouraged to discuss their case with the course Instructor.

AFNS 500 Individual Study
★3 *(fi 6)* (either term, variable). Project or reading course under the supervision of a Faculty member requiring preparation of a comprehensive report. Prerequisite: consent of Department. Note: May be taken more than once provided the topic is different.

AFNS 502 Advanced Study of Food Fermentations
★3 *(fi 6)* (second term, 3-1s-0). Readings and class presentations on current developments in bacterial or fungal fermentation of foods. Development in Probiotics. Lectures are the same as for NU FS 402, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 502 and NU FS 402. Prerequisite: MICRB 265 or NU FS 361 or 363.

AFNS 503 Processing of Milk and Dairy Products
★3 *(fi 6)* (first term, 3-1s-0). Technological principles of milk treatment and processes for fluid milk products; concentrated, dried, sterilized and fermented dairy products; cheese, butter and ice cream. Lectures are the same as for NU FS 403, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 503 and NU FS 403. Prerequisite: NU FS 374.

AFNS 506 Rangeland Plant Communities of Western Canada
★3 *(fi 6)* (second term, 3-0-3). Examines major rangeland plant communities and their physical environments in western Canada, including individual plant identification and ecology. Includes a review of various land uses such as livestock and wildlife grazing within these communities, their response to disturbances such as herbivory and fire, and other management considerations. Lectures and labs are the same as for ENCS 406, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 506 and ENCS 406. Prerequisite: ENCS 356 or consent of instructor. [Agricultural, Food and Nutritional Science]

AFNS 509 Management of Animal Environments
★3 *(fi 6)* (second term, 3-0-3). Methods of providing acceptable environments for confined animals. Topics include animal well-being, technology to maintain good air quality, minimizing the impact of intensive livestock operations on receiving environments, and farmstead planning. Lectures and labs are the same as for AN SC 409, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 509, AN SC 309 and 409. Prerequisite: consent of instructor.

AFNS 512 Protein and Amino Acid Metabolism
★3 *(fi 6)* (first term, 0-3s-0). Comprehensive overview of the major aspects of protein and amino acid metabolism. Publications and topics cover issues relating to protein and amino acid metabolism in both humans and domestic animals. Offered in alternate years commencing 2002/03. Prerequisite: consent of Instructor.

AFNS 520 Ruminant Physiology
★3 *(fi 6)* (first term, 3-0-0). A lecture and discussion course on current literature in digestive physiology and endocrinology of ruminant animals. Offered in alternate years commencing in 1998/99. Prerequisite: ★3 in each of Nutrition and Physiology.

AFNS 521 Carcass and Meat Quality
★3 *(fi 6)* (second term, 3-0-3/2). The conversion of muscle to meat: definitions and measurement of carcass and meat quality; influences of pre-and post-slaughter factors on carcass and meat quality. The lab will consist of a two-day field trip during Reading Week. Lectures and labs are the same as for AN SC 420, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 521 and AN SC 420. Prerequisites: ★3 Biochemistry or AN SC 320 and consent of instructor.

AFNS 527 Nutritional Toxicology and Food Safety
★3 *(fi 6)* (first term, 3-0-0). Providing students with an understanding of the principles of risk: benefit evaluations related to the metabolic consequences of exposure to foodborne chemicals and therapeutic agents, and to microbiological concerns about foods. Lectures are the same as for NU FS 427, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 527 and NU FS 427. Prerequisites: ★3 Biochemistry and ★3 in Microbiology or consent of instructor.

AFNS 528 Recent Advances in Nutraceuticals
★3 *(fi 6)* (second term, 0-3s-0). Critical evaluations of the current literature on food components, including functional foods and nutraceuticals. Students learn to interrelate the chemistry, health potential and toxological implications of the components. Seminars are the same as for NU FS 428, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 528 and NU FS 428. Prerequisite: NU FS 200 or consent of instructor.

AFNS 540 Plant Disease Diagnostics
★3 *(fi 6)* (either term, 0-0-6). Identification of diseases of field, greenhouse and forest crops. A disease collection is required. Credit cannot be obtained for PL SC 520 and AFNS 540.

AFNS 550 Compost Science and Technology
★3 *(fi 6)* (first term, 3-0-3). Biological, chemical and physical interactions involved in composting of organic materials. Selection of appropriate technologies. Design, management, and economics of composting facilities. Lectures are the same as for AFNS 450, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 450 and 550. Prerequisites: ★3 BIOL and (★3 PHYS or CHEM or equivalent).

AFNS 552 Nutritional Aspects of Chronic Human Diseases
★3 *(fi 6)* (second term, 3-0-0). A lecture and reading course for senior undergraduate students which will address the scientific basis for nutritional intervention in chronic human disease. Lectures are the same as for NUTR 452, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 552, NUTR 452, and NU FS 452. Prerequisites: NUTR 301 (or 303) and 302, or consent of Instructor.

AFNS 554 Unit Operations in Food Preservation
★3 *(fi 6)* (second term, 3-0-3). Processes used in food preservation. Dehydration, refrigeration and freezing, sterilization and canning, irradiation. Effect of processing on food properties. Lectures are the same as for NU FS 454, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 554 and NU FS 454. Prerequisite: NU FS 283, NU FS 361 (or 363) and 372 (or 373) or consent of instructor.

AFNS 561 Ruminant Digestion, Metabolism, and Nutrition
★3 *(fi 6)* (second term, 3-0-3). Integration of theory and practical concepts in ruminant nutrition, digestion and metabolism through topics such as energy flow in ruminants, protein systems and net feed efficiency. Laboratories will involve formulation of rations for various physiological states of beef and dairy cattle, economical rations, feed mixes, protein systems (degradable and undegradable protein systems) and net feed efficiency formulations. Lectures and labs are the same as for AN SC 461, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 561 and AN SC 461. Prerequisite: consent of instructor.

AFNS 562 Swine Nutrition
★3 *(fi 6)* (second term, 3-0-3). Nutrient utilization and requirements, feed ingredients, and applied feeding program. Feed formulation strategies and current topics in swine nutrition will be discussed in detail. Lectures and labs are the same as for AN SC 462, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 562 and AN SC 462. Prerequisite: consent of instructor.

AFNS 563 Poultry Nutrition
★3 *(fi 6)* (second term, 3-0-3). Nutritional requirements, feeding programs, and feed ingredients used for poultry. Feed formulation strategies and current topics in poultry nutrition will be discussed extensively. Lectures and labs are the same as for AN SC 463, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AN SC 463, AFNS 515, and 563. Prerequisite: Consent of Instructor.

AFNS 565 Principles of Plant Breeding
★3 *(fi 6)* (first term, 3-0-0). Basic principles of crop improvement by plant breeding. Development of plant breeding methods and their relationship to the major crop species. Lectures are the same as for PL SC 465, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 565 and PL SC 465. Prerequisites: BIOL 207 and ★3 statistics.

AFNS 566 Advanced Food Microbiology
★3 *(fi 6)* (second term, 3-1s-0). A lecture/discussion course on selected topics in food microbiology. Offered in alternate years commencing in 1999/00. Prerequisite: MICRB 265 or NU FS 361 or 363. Credit cannot be obtained for NU FS 566 and AFNS 566.

AFNS 568 Clinical Nutrition
★3 *(fi 6)* (second term, 3-0-3). Basic principles of nutrition in clinical situations. The role of diet in the management of various diseases. The laboratory sessions include practical experience in providing individualized nutritional care for clients from various cultural backgrounds. Lectures and labs are the same as for NUTR 468, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 568, NUTR 468 and NU FS 468. Prerequisite: NUTR 301 (or 303). Corequisite: NUTR 302.

AFNS 570 Experimental Procedures in Nutrition and Metabolism
★3 *(fi 6)* (either term, 0-0-6). Current methodologies in nutrition and metabolism. Prerequisites: NUTR 301 and 302 or equivalent, or consent of Instructor. Credit cannot be obtained for NUTR 504 or AFNS 570.

AFNS 571 Applied Poultry Science
★3 *(fi 6)* (second term, 3-0-3). Study of modern poultry production based on an understanding of avian anatomy, physiology, behavior, health, breeding, and nutrition. Emphasis on interaction of the above parameters through group research projects with commercial poultry. Lectures and labs are the same as for AN SC 471, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 571 and AN SC 471. Prerequisite: AN SC 200 or consent of instructor.

AFNS 572 Practical Case Studies in Rangeland Management and Conservation
★3 *(fi 6)* (first term, 3-0-3). Cumulative effects of fire, grazing, browsing, and improvement practices on the productivity and species composition of range and pasture ecosystems, including management implications. Extended field trip prior to the start of classes. Lectures and labs are the same as for ENCS 471, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 572 and ENCS 471. Offered in alternate years commencing 2001/02. Prerequisite: ENCS 356; ENCS 406 strongly recommended.

AFNS 576 Swine Production and Management
★3 *(fi 6)* (second term, 3-0-3). Review of functions, production practices, and efficiencies in various sectors of the Swine industry. Evaluation of breeding, feeding, housing management, and disease prevention practices that optimize production efficiency and animal well-being. The laboratory period involves analysis of the production efficiency of a commercial swine unit. Lectures and labs are the same as for AN SC 476, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 576 and AN SC 476. Prerequisite: AN SC 200 or consent of instructor.

AFNS 577 Advanced Community Nutrition
★3 *(fi 6)* (second term, 3-0-3). Examination of nutrition problems in contemporary communities that relate to health promotion, food security, policy, program planning and community nutrition throughout the lifecycle. Discussion of nutrition programs and resources. Students will develop the skills to write a community grant application. Lectures and labs are the same as for NUTR 477, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 577, NUTR 477 and NU FS 477. Prerequisite: consent of instructor.

AFNS 578 Advanced Clinical Nutrition
★3 *(fi 6)* (either term, 3-0-3). The principles of diet therapy in selected areas of current interest. Emphasis on case studies, research and practical problems in clinical dietetics. Lectures and labs are the same as for NUTR 476, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 578, NUTR 476, and NU FS 476. Prerequisite: NU FS 468 or NUTR 468.

AFNS 579 Advanced Nutrition: Vitamins and Inorganic Elements
★3 *(fi 6)* (first term, 3-0-0). A lecture and reading course in vitamins and inorganic elements. Introduction to seminar presentation and critical evaluation of current literature. Students will also learn the skill of writing a scientific paper. Lectures are the same as for NUTR 479, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 579, NUTR 479, and NU FS 479. Prerequisite: NUTR 302. NUTR 301 (or 303) recommended.

AFNS 580 Advanced Study of Foodborne Pathogens
★3 *(fi 6)* (second term, 3-1s-0). Emerging issues in microbiological safety of foods. Reading and class presentations on current developments in the microbiological safety of foods. Lectures are the same as for NU FS 480, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 580 and NU FS 480. Prerequisite: MICRB 265 or NU FS 361 or 363.

AFNS 581 Advanced Foods
★3 *(fi 6)* (second term, 3-0-0). Critical evaluation of current literature on the effects of ingredients and processing on quality characteristics of foods. Lectures are the same as for NU FS 481, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 581 and NU FS 481. Prerequisites: NU FS 374 and ★3 Biochemistry or consent of instructor.

AFNS 582 Diseases of Field and Horticultural Crops
★3 *(fi 6)* (second term, 0-3s-0). Diseases of cereal, oilseed, pulse, forage, vegetable, fruit, and ornamental crops. Course is the same as PL SC 481, but with additional assignments and evaluation appropriate to graduate studies. Offered in alternate years commencing in 2002/03. Credit will only be given for one of AFNS 582 and PL SC 481. Prerequisite: PL SC 380 or consent of instructor.

AFNS 585 Advanced Quantitative Genomics
★3 *(fi 6)* (second term, 3-0-3). Genetics and analysis of quantitative traits in farm animals and plants. Detecting, locating and measuring effects of quantitative trait loci (QTL). Recent developments in QTL mapping and discovery. The laboratory sessions include commonly used software for analyzing data from breeding and genomics experiments. Prerequisite: Consent of Instructor.

AFNS 595 Integrated Crop Protection
★3 *(fi 6)* (second term, 0-3s-0). Integrated agronomic, mechanical, biological, and chemical control of insects, disease organisms, and weeds that interfere with field crop and horticultural crop production. Lectures are the same as for PL SC 495, but with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 595 and PL SC 495. Prerequisites: At least two of ENT 207, PL SC 352 or PL SC 380 as prerequisites and the third as a corequisite.

AFNS 601 Seminar
★1 *(fi 2)* (either term, 0-1.5s-0). Provides a forum in which graduate students prepare and present seminars or papers at both general and technical levels. Attendance is required of all graduate students. Students participate as presenters, discussants and evaluators.

AFNS 602 Graduate Reading Project
★3 *(fi 6)* (either term, variable). Individual study. Critical reviews of selected literature under the direction of a Faculty member. Note: May be taken more than once if the topic is different. Prerequisite: consent of Department.

AFNS 603 Graduate Research Project
★3 *(fi 6)* (either term, variable). Directed laboratory study under supervision of a Faculty member. Note: May be taken more than once if the topic is different. Prerequisite: consent of Department.

AFNS 660 Communication in Science
★3 *(fi 6)* (first term, 0-3s-0). Students will learn effective communication skills for life as a graduate student and a future scientist. Topics will include the scientific method; paper, thesis and grant writing; poster and lecture (power point) development and delivery; ethics in science; graduate student supervisor relations. Open only to graduate students in the Department of Agricultural, Food and Nutritional Science.

AFNS 670 Current Topics in Nutrition and Metabolism
★3 *(fi 6)* (either term, 0-3s-0). Selected topics in digestive physiology, fat/carbohydrate/protein metabolism, vitamins/minerals, dietary modulation of function or ruminant nutrition. May be taken for credit more than once.

AFNS 680 Doctoral Seminar
★3 *(fi 6)* (second term, 0-3s-0). Discussion and presentations based on current topics to provide PhD candidates with experience and understanding in advanced nutrition. Students also learn about research funding and how to develop a major grant application. Credit cannot obtained for NU FS 680 and AFNS 680.

AFNS 900 Directed Research Project (Course-based Masters)
★3 *(fi 6)* (either term, unassigned). Individual study supervised by the student's supervisor, requiring the preparation of a comprehensive report, presentation of a seminar and oral examination by the student's supervisor and one additional faculty member. Open only to students in the MAg, MEng or MSc course-based program.

221.6 Agriculture, Forestry, and Home Economics, AFHE

Undergraduate Courses

AFHE 304 Communication Theory and Practice
★3 *(fi 6)* (either term, 3-0-2). Principles of business communication, including written, oral, and electronic components. Prerequisite: ★6 ENGL or ★3 ENGL and ★3 Social Science/Humanities (ENGL 111, 112, 113, or 114 recommended). Open only to Faculty of Agriculture, Forestry, and Home Economics students. Credit will be given for only one of AFHE 304 and AGFOR 204.

221.7 American Sign Language, ASL

Department of Modern Languages and Cultural Studies
Faculty of Arts

Notes
(1) The Department reserves the right to place students in the language course appropriate to their level of language skill.
(2) Placement tests may be administered in order to assess prior background. Students with an American Sign Language background should consult a Department advisor. Such students may be granted advanced placement and directed to register in an advanced course more suitable to their level of ability. Students seeking to fulfill their Language Other than English requirement may begin at any one appropriate level, but must take the full ★6 in one language.
(3) The Department will withhold credit from students completing courses for

which prior background is deemed to make them ineligible. For example, 100-level courses are normally restricted to students with little or no prior knowledge in that language. Should a student with matriculation standing, or those possessing prior background (such as native speakers or those for whom it is their first language) register in the 100-level course, credit may be withheld.

Undergraduate Courses

O ASL 111 Beginners' American Sign Language I
★3 *(fi 6)* (either term, 5-0-0). Designed to provide basic practical communication and conversational skill in American Sign Language for students with little or no previous background. Covers material in matriculation-level ASL. Note: Not to be taken by students with native or near native proficiency, or students with credit in ASL 35 or its equivalents in Canada or other countries. Not to be taken by students with credit in EDPY 474 or 565.

O ASL 112 Beginners' American Sign Language II
★3 *(fi 6)* (either term, 5-0-0). Prerequisite: ASL 111 or consent of Department. Note: Not to be taken by students with native or near native proficiency, or students with credit in ASL 35 or its equivalents in Canada or other countries.

O ASL 211 Intermediate American Sign Language I
★3 *(fi 6)* (either term, 5-0-0). Intensive instruction in ASL.Topics covered on deaf community and culture. Prerequisite: ASL 35 or ASL 112 or consent of Department.

O ASL 212 Intermediate American Sign Language II
★3 *(fi 6)* (either term, 5-0-0). Prerequisite: ASL 211 or consent of Department.

221.8 Anaesthesia, ANAES

Department of Anesthesiology and Pain Medicine
Faculty of Medicine and Dentistry

Undergraduate Courses

ANAES 546 Anaesthesiology and Pain Medicine Student Internship
★1 *(fi 2)* (either term, 1 week). Student Internship in anaesthesiology and pain medicine for students registered in the MD program.

221.9 Anatomie, ANATE

Faculté Saint-Jean

Cours de 1er cycle

ANATE 140 Anatomie
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Introduction aux structures du corps humain. Doit être complété avant l'année 2 du BScInf (bilingue). Notes: La priorité sera accordée aux étudiants du BScInf (bilingue). Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour NURS 140.

221.10 Anatomy, ANAT

Division of Anatomy
Faculty of Medicine and Dentistry

Undergraduate Courses

O ANAT 200 Human Morphology
★3 *(fi 6)* (either term, 3-0-0). Overview of human structure. Emphasis on the systems of the body and their cooperative role in normal function.

O ANAT 400 Human Embryonic Development
★3 *(fi 6)* (first term, 3-0-0). A study of the development of the human embryo from conception to birth. The development of cells, tissues and organs of specific major structures will be covered including their relative development to other systems and structures. An understanding of anomalous development and the ability to survive will be included based on a thorough understanding of normal development. Prerequisite: ANAT 200 or consent of Division. Note: Credit will be granted for only one of ANAT 300 or 400.

O ANAT 401 Human Neuroanatomy
★3 *(fi 6)* (second term, 3-0-0). A study of the human nervous system including its development and function from an anatomical viewpoint. Both the central and peripheral nervous systems will be presented with some emphasis on abnormal development and its consequences. There will be an emphasis on clinical application where appropriate. Prerequisite: ANAT 200 or consent of Division. Note: Credit will be granted for only one of ANAT 301 or 401.

O ANAT 402 Human Histology
★3 *(fi 6)* (first term, 0-3s-0). A detailed study of the histology of the tissues and organ systems of the human body and the structural principles that govern their organization, interaction and physiological function. Will be based on self-study, utilizing an interactive, web-based learning program, and group discussions during weekly seminar sessions. Prerequisite: ANAT 200 or equivalent and consent of Division.

O ANAT 403 The Human Body
★6 *(fi 12)* (first term, 3-0-5). A detailed, regional study of the gross anatomy of the human body using functional, clinical, and evolutionary perspectives. Will include lectures and laboratory sessions involving dissection of human cadavers. Prerequisite: ANAT 200 or equivalent and consent of Division.

O ANAT 490 Individual Study
★3 *(fi 6)* (either term, 0-0-6). Registration is contingent upon a student having made prior arrangements with a Faculty member in the Division. Credit may be obtained for this course more than once. This is primarily a supervised self-study in any of the anatomical disciplines. Prerequisite: consent of Division.

O ANAT 491 Current Topics in Anatomy
★3 *(fi 6)* (either term, 0-1s-0). Discussion of topics relevant to the anatomical disciplines. Credit may be obtained for this course more than once. Prerequisite: consent of Division.

O ANAT 497 Research Project
★4 *(fi 8)* (either term, 0-0-6). Directed research carried out in the laboratory of an assigned member of the Division. Credit for this course may be obtained more than once. Successful completion requires a written report and oral presentation on the research project. Registration is contingent upon a student having made prior arrangements with a Faculty member in the Division. Prerequisite: consent of Division.

Graduate Courses

O ANAT 600 Medical Gross Anatomy
★8 *(fi 16)* (two term, 0-0-12). Advanced study of human gross anatomy. Will entail supervised, self-directed, hands-on dissection by the student for the examination of human structure and function. Particular emphasis will be placed on the clinical relevance of Human Anatomy and its importance to clinical medicine. Prerequisite: consent of Division.

O ANAT 601 Medical Neuroanatomy
★4 *(fi 8)* (Spring/Summer, 3-0-3). Advanced study of the human nervous system. Lectures will be accompanied by hands-on dissection of human tissue. Emphasis will be placed on the clinical relevance of central and peripheral nervous system structure and their involvement with motor and sensory processing systems. Prerequisite: consent of Division.

O ANAT 603 Medical Histology
★3 *(fi 6)* (Spring/Summer, 0-3s-1). Advanced study of human histology with an emphasis on the relevance of histological examination to clinical medicine. Students will participate in discussions and complete a web-based interactive program. Prerequisite: consent of Division.

O ANAT 604 Medical Embryology
★3 *(fi 6)* (first term, 3-0-1). Advanced study of human development from conception to birth with particular reference to clinical issues in humans. Lectures will be supplemented with practical examination of specimens. Prerequisite: consent of Division.

O ANAT 606 Selected Topics in Advanced Human Anatomy
★3 *(fi 6)* (either term, 0-0-3). An in-depth, supervised, self-directed study focussing on topics relevant to the anatomical disciplines. Credit may be obtained for this course more than once. Registration is contingent upon a student having made prior arrangements with a Faculty member in the Division. Prerequisite: consent of Division.

O ANAT 607 Current Topics in Human Anatomy
★3 *(fi 6)* (either term, 0-1s-0). Discussion of topics relevant to the anatomical disciplines. Credit may be obtained for this course more than once. Prequisite: consent of Division.

221.11 Andragogie, ANDR

Faculté Saint-Jean

Cours de 2e cycle

ANDR 520 Formation expérientielle à la dynamique de groupe
★3 *(fi 6)* (l'un ou l'autre semestre, 1-2s-0). Les concepts de groupe, d'organisation et d'institution. La dynamique de groupe: définition, ses différentes étapes, son utilisation dans le groupe de tâche et d'apprentissage. Préalable(s): ANDR 510 ou l'approbation du Vice-doyen aux affaires académiques.

221.12 Anglais, ANGL

Faculté Saint-Jean

Notes

(1) Un seul cours complet (ou 2 demi-cours) au niveau 100 peut être crédité pour le BA.

(2) Prérequis pour les cours au niveau 200: ANGL 101.

Undergraduate Courses

ANGL 101 Critical Reading and Writing
★6 *(fi 12)* (two term, 3-0-0). A critical study of literature in English, concentrating on works written since 1800, with a minimum 30% of class time devoted to writing instruction. Note: Not to be taken by students with credit in ANGL 100 or ANGL 110 or in ENGL 104/105.

221.13 Anglais langue seconde, ALS

Faculté Saint-Jean

Cours de 1er cycle

ALS 100 Anglais langue seconde (Niveau débutant)
★6 *(fi 12)* (aux deux semestres, 5-0-0). Études des éléments et des structures de base de l'anglais parlé et écrit. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour English 30, English 33, ANGL 113, ESL 140, ESL 145, ESL 150 ou leurs équivalents et il se limite aux étudiants inscrits à la Faculté Saint-Jean. Affectation par test de placement.

ALS 160 Anglais langue seconde (Niveau intermédiaire)
★6 *(fi 12)* (aux deux semestres, 5-0-0). Étude des éléments et des structures de base de l'anglais parlé et écrit. Note: Anciennement ANGL 113. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour English 30, English 33, ANGL 113, ESL 140 et 145, ESL 150, ou leurs équivalents et il se limite aux étudiants inscrits à la Faculté Saint-Jean. Préalable(s): ALS 100 ou l'équivalent, ou affectation par test de placement.

221.14 Animal Science, AN SC

Department of Agricultural, Food and Nutritional Science
Faculty of Agriculture, Forestry, and Home Economics

Note: See also Agricultural, Food and Nutritional Science (AFNS), Environmental and Conservation Sciences (ENCS), Interdisciplinary (INT D), Nutrition (NUTR), Nutrition and Food Science (NU FS), Plant Science (PL SC), and Renewable Resources (REN R) for related courses.

Undergraduate Courses

O AN SC 110 Equine Physiology and Nutrition
★3 *(fi 6)* (first term, 3-0-0). Principles of digestive, exercise, environmental, and reproductive physiology. Nutrient requirements of the horse; sources of energy and nutrients; feed formulation. Not available to students with credit in 300-level courses in animal physiology and nutrition.

O AN SC 200 Principles of Animal Agriculture
★3 *(fi 6)* (either term, 3-0-3). Principles and practices of modern animal production and management. Brief introduction to the structure of the livestock, poultry, and game ranching industries. Principles of animal management, breeding and feeding. Current issues in animal agriculture. Students gain direct experience with animals in production/research environments. Prerequisite: Biology 30.

O AN SC 260 Fundamentals of Animal Nutrition
★3 *(fi 6)* (first term, 3-0-3). Function, metabolism, homeostasis, requirements and sources of nutrients and energy for animals. Laboratory will involve principles of diet formulation. Prerequisite: ★3 in university-level biology or chemistry. Credit will be given for only one of AN SC 260, NUTR 260 and NUTR 301 or equivalent.

O AN SC 310 Physiology of Domestic Animals
★3 *(fi 6)* (first term, 3-0-3). Fundamental principles of regulation and maintenance of the internal environment. Includes a review of mechanisms providing for homeorrhesis and well-being of domestic animals in response to changes in the external environment (e.g. light, temperature, social). Prerequisites: BIOL 107 and ★6 in university-level chemistry.

O AN SC 311 Metabolic Physiology of Domestic Animals
★3 *(fi 6)* (second term, 3-0-3). The physiological basis of the metabolic processes in domestic animals. Includes a review of the physiological mechanisms and neuroendocrine regulation of digestion, metabolism, growth and lactation. Prerequisite: AN SC 310 or equivalent.

AN SC 312 Reproductive Physiology of Domestic Animals
★3 *(fi 6)* (second term, 3-0-3). The physiological basis of reproduction, fertility and embryonic development in domestic animals in relation to animal productivity. The study of the physiological mechanisms regulating gonadal function, fertilization, implantation, pregnancy and parturition as well as the physiological basis for sound reproductive management. Prerequisite: AN SC 310 or equivalent.

O AN SC 320 Livestock Growth and Meat Production
★3 *(fi 6)* (first term, 3-2s-0). Concepts of growth and development applied to meat production from farm livestock. Form and function of bone, muscle and fat. Livestock and carcass appraisal. Prerequisite: AN SC 200 or ★3 in university level biology.

O AN SC 322 Poultry Product Technology
★3 *(fi 6)* (first term, 3-0-3). Understanding product concepts, consumer trends, value-added processing technology, marketing strategy and research and development in the poultry industry. Prerequisites: ★3 in university-level biology and ★6 in university-level chemistry. Offered in alternate years commencing in 2001/02.

O AN SC 374 Animal Health and Welfare
★3 *(fi 6)* (first term, 3-0-0). Introduction to major diseases of farm animals and promotion of health and welfare through management. Issues in the ethical use of animals and their welfare in agriculture, wildlife management, animal research and as companions. Prerequisite: ★3 in university-level biology.

O AN SC 385 Animal Improvement
★3 *(fi 6)* (second term, 3-0-2). Application of genetic principles to the improvement of livestock and poultry. Prerequisites: BIOL 107/207 and third year standing or higher.

O AN SC 391 Metabolism
★3 *(fi 6)* (second term, 3-0-0). Emphasis on metabolism of carbohydrates, proteins, amino acids, nucleic acids and lipids. Prerequisite: PL SC 331 or ★3 in Biochemistry.

O AN SC 400 Individual Study
★3 *(fi 6)* (either term, variable). Project or reading course supervised by a Faculty member, requiring preparation of a comprehensive report. Prerequisites: Third year standing or higher and consent of Department. Note: May be taken more than once if topic is different.

O AN SC 409 Management of Animal Environments
★3 *(fi 6)* (second term, 3-0-3). Methods of providing acceptable environments for confined animals. Topics include animal well-being, technology to maintain good air quality, minimizing the impact of intensive livestock operations on receiving environments, and farmstead planning. Credit will only be given for one of AFNS 509, AN SC 309 and 409. Graduate students may not register for credit (see AFNS 509). Prerequisite: AN SC 200 or ★3 university-level biology.

O AN SC 410 Regulation of Reproduction in Domestic Animals
★3 *(fi 6)* (first term, 3-0-3). Study of basic physiological mechanisms involved in the control of reproduction in domesticated animals as a basis for developing practical approaches for the regulation of reproductive processes. Prerequisite: AN SC 311 or 312; or ZOOL 343 or equivalent.

O AN SC 420 Carcass and Meat Quality
★3 *(fi 6)* (second term, 3-0-3/2). The conversion of muscle to meat: definitions and measurement of carcass and meat quality; influences of pre-and post-slaughter factors on carcass and meat quality. The lab will consist of a two-day field trip during Reading Week. Graduate students may not register for credit (see AFNS 521). Credit will only be given for one of AFNS 521 and AN SC 420. Prerequisite: ★3 Biochemistry or AN SC 320, or consent of instructor.

O AN SC 461 Ruminant Digestion, Metabolism, and Nutrition
★3 *(fi 6)* (second term, 3-0-3). Integration of theory and practical concepts in ruminant nutrition, digestion and metabolism through topics such as energy flow in ruminants, protein systems and net feed efficiency. Laboratories will involve formulation of rations for various physiological states of beef and dairy cattle, economical rations, feed mixes, protein systems (degradable and undegradable protein systems) and net feed efficiency formulations. Graduate students may not register for credit (see AFNS 561). Credit will only be given for one of AFNS 561 and AN SC 461. Prerequisite: AN SC 260 or ★3 NUTR. Corequisite: AN SC 311.

AN SC 462 Swine Nutrition
★3 *(fi 6)* (second term, 3-0-3). Nutrient utilization and requirements, feed ingredients, and applied feeding programs for swine. Feed formulation strategies and current topics in swine nutrition will be discussed in detail. Graduate students may not register for credit (see AFNS 562). Credit will only be given for one of AFNS 562 and AN SC 462. Prerequisite: AN SC 260 or ★3 NUTR. Corequisite: AN SC 311.

AN SC 463 Poultry Nutrition
★3 *(fi 6)* (second term, 3-0-3). Nutritional requirements, feeding programs and feed ingredients used for poultry. Feed formulation strategies and current topics in poultry nutrition will be discussed extensively. Graduate students may not register for credit (see AFNS 563). Credit will only be given for one of AFNS 515, 563 and AN SC 463. Prerequisite: AN SC 260 or ★3 NUTR. Corequisite: AN SC 311.

O AN SC 471 Applied Poultry Science
★3 *(fi 6)* (second term, 3-0-3). Study of modern poultry production based on an understanding of avian anatomy, physiology, behavior, health, breeding, and nutrition. Emphasis on interaction of the above parameters through group research projects with commercial poultry. Graduate students may not register for credit (see AFNS 571). Credit will only be given for one of AFNS 571 and AN SC 471. Prerequisite: AN SC 200 or consent of instructor.

O AN SC 472 Applied Dairy Science
★3 *(fi 6)* (first term, 3-0-3). Integration of the nutritional, physiological and biochemical processes involved in the production of quality milk. Structure of the dairy industry and evaluation of management practices to optimize production efficiency and animal well-being. Laboratory involves analysis of modern dairy production systems with a view to optimizing profitability. Prerequisite: AN SC 200 or consent of Instructor.

O AN SC 474 Applied Beef Cattle Science
★3 *(fi 6)* (first term, 3-0-3). Examination of current and potential future production and management practices to optimize production efficiency and animal well being in the Canadian and international beef industry. Prerequisite: AN SC 200 or consent of Instructor.

O AN SC 475 Wildlife Production
★3 *(fi 6)* (second term, 3-0-3). Biological, technical, legal, and economic basis of the international wildlife farming and ranching industries. Opportunities for livestock diversification with emphasis on elk, bison, and exotics. Prerequisite: AN SC 200 or consent of Instructor.

O AN SC 476 Swine Production and Management
★3 *(fi 6)* (second term, 3-0-3). Review of functions, production practices, and efficiencies in various sectors of the Swine industry. Evaluation of breeding, feeding, housing management, and disease prevention practices that optimize production efficiency and animal well-being. The laboratory period involves analysis of the production efficiency of a commercial swine unit. Graduate students may not register for credit (see AFNS 576). Credit will only be given for one of AFNS 576 and AN SC 476. Prerequisite: AN SC 200 or consent of instructor.

O AN SC 484 Animal Molecular Biology
★3 *(fi 6)* (first term, 2-1s-0). Lecture and discussion course dealing with concepts in gene expression, gene manipulation, and application of molecular biology to animal biotechnology. Prerequisites: BIOCH 203/205, or 200/310 or PL SC 331 and AN SC 391, or consent of Instructor.

Graduate Courses

Notes
(1) 400-level courses in AN SC may be taken for credit by graduate students under certain circumstances with approval of the student's supervisor or supervisory committee. A 300-level course may be taken for credit by graduate students under certain circumstances with approval of the AFNS Graduate Program Committee. See §174.1.1(1).
(2) See also Agricultural, Food and Nutritional Science (AFNS) listings for related courses.

221.15 Anthropologie, ANTHE

Faculté Saint-Jean

Cours de 1er cycle

O ANTHE 101 Introduction à l'anthropologie
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Une introduction à l'anthropologie par l'étude de concepts principaux et d'idées organisatrices tels que l'évolution humaine, l'apparition de la culture, l'organisation sociale, les théories de la culture, les systèmes symboliques, la dynamique de la culture. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits en ANTHE 202 ou 201.

O ANTHE 110 Ethnologie du sexe, de l'âge et du pouvoir
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Dans toute société, le statut social de l'individu et des groupes change au cours du cycle de la vie. Ce cours examine comment l'âge et le sexe privilégient les rôles et le statut social dans des sociétés différentes.

O ANTHE 207 Introduction à l'anthropologie sociale et culturelle
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Etude comparative de la société et de la culture de l'homme, en particulier dans les communautés nonoccidentales, en insistant sur la famille, la structure sociale, l'économie, les institutions politiques et la religion; les procédures de changement. Préalable(s): ANTHE 101. Cours à distance. Voir §200.

O ANTHE 208 Introduction à l'anthropologie linguistique
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Etude anthropologique du langage et de la communication. Aperçu rapide des méthodes d'enquête sur le terrain et des méthodes analytiques et théorie de l'anthropologie linguistique. Préalable(s): ANTHE 101.

O ANTHE 310 Anthropologie des rapports de sexes
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Étude comparée des différences sexuelles et des rapports de sexes. L'analyse des perspectives et théories dominantes dans les domaines suivants: la primatologie, la biologie, l'archéologie, l'évolution humaine, l'ethnologie et la culture populaire. Préalable(s): ANTHE 110 ou 207 ou ANTHR 209, ou l'approbation du Vice-doyen aux affaires académiques.

O ANTHE 320 Ethnologie de la religion
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Introduction à l'étude comparative des religions et des phénomènes qui s'y rattachent; tels la magie, les tabous, le chamanisme et la sorcellerie. Des exemples ethnographiques sont utilisés pour appuyer une analyse des liens entre pensées et rites religieux et autres aspects de la vie sociale.

O ANTHE 365 Culture populaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Exploration approfondie de la culture populaire utilisant différentes approches théoriques et l'application des concepts de l'Anthropologie. Préalable(s): ★3 en ANTHE, ou autre science sociale, niveau 100.

221.16 Anthropology, ANTHR

Department of Anthropology
Faculty of Arts

Notes
(1) See also INT D 120 and 443 for courses offered by more than one Department or Faculty and which may be taken as options or as a course in this discipline.
(2) Students with credit in ANTHR 202 have the equivalent of ANTHR 101 or 201.

Undergraduate Courses

O ANTHR 101 Introductory Anthropology
★3 *(fi 6)* (either term, 3-0-0). Approaches to the study of Anthropology through the study of human biological, cultural and linguistic diversity, past and present.

O ANTHR 110 Gender, Age, and Culture
★3 *(fi 6)* (either term, 3-0-0). An anthropological review and comparison of cultures in terms of social positions based on differences in sex and age.

O ANTHR 150 Race and Racism
★3 *(fi 6)* (either term, 3-0-0). The challenge of racism in modern societies and the response of anthropology, including the history of how the 'race' concept has been used to explain human variation.

ANTHR 206 Introduction to Archaeology
★3 *(fi 6)* (either term, 2-0-1). Introduction to the nature, purposes, theory and methods of anthropological archaeology. Emphasis on principles of reconstruction of past societies from archaeological evidence and the explanation of cultural evolution. Prerequisite: A 100-level course in anthropology or consent of Department.

ANTHR 207 Introduction to Social and Cultural Anthropology
★3 *(fi 6)* (either term, 2-1s-0). Comparative study of human society and culture, particularly non-Western communities, with special attention to the family, social structure, economics and political institutions, and religion; processes of change. Prerequisite: A 100-level course in anthropology or consent of Department.

ANTHR 208 Introduction to Linguistic Anthropology
★3 *(fi 6)* (either term, 3-0-0). The anthropological study of language and communication. A brief survey of field and analytical methods and the theory of linguistic anthropology. Prerequisite: A 100-level course in anthropology or consent of Department.

ANTHR 209 Introduction to Physical Anthropology
★3 *(fi 6)* (either term, 2-0-1). Survey of theory and basic data in human evolution and human variation. Topics include primatology, osteology, hominoid paleontology, variation in modern populations. Prerequisite: A 100-level course in Anthropology, or the consent of Department.

O ANTHR 219 World Prehistory
★3 *(fi 6)* (either term, 3-0-0). A survey of the archaeological evidence for human cultural evolution.

O ANTHR 230 Anthropology of Science, Technology, and Environment
★3 *(fi 6)* (either term, 3-0-0). Science as a cultural practice, cultural effects and globalization of technology, changing views of nature, gender and science, traditional ecological knowledge, and the evolution of technology.

O ANTHR 246 Peoples and Cultures of the Circumpolar Region
★3 *(fi 6)* (either term, 3-0-0). Comparative study of indigenous Arctic and sub-Arctic societies. Archaeological and ethnological considerations of northern societies of the Old and New Worlds. Offered in alternate years.

L ANTHR 250 North American Aboriginal Peoples
★3 *(fi 6)* (either term, 3-0-0). Aboriginal North American cultures through selected ethnographies and other sources. Offered in alternate years.

L ANTHR 256 Alberta Archaeology
★3 *(fi 6)* (either term, 3-0-0). Introduction to Alberta's past as reconstructed by archaeology.

O ANTHR 261 Peoples and Cultures of Middle America
★3 *(fi 6)* (either term, 3-0-0). The cultural history of the native peoples of Mexico and Guatemala. Analysis of contemporary Indian communities. Offered in alternate years.

O ANTHR 262 Peoples and Cultures of South America
★3 *(fi 6)* (either term, 3-0-0). The cultural history of the native peoples of South America. Analysis of contemporary Indian communities. Offered in alternate years.

O ANTHR 270 Peoples and Cultures of Oceania
★3 *(fi 6)* (either term, 3-0-0). Historical, economic, and environmental factors which have helped shape major cultures and subcultures of the central and southern Pacific region (Polynesia, Micronesia, Melanesia, and Australia). Offered in alternate years.

O ANTHR 271 Peoples and Cultures of Southeast Asia
★3 *(fi 6)* (either term, 3-0-0). Cultures and societies in Southeast Asia: Burma, Thailand, Malaysia, Cambodia, Laos, Vietnam, Indonesia, and the Philippines; origins and developments, modern forms, trends of change. Offered in alternate years.

O ANTHR 278 Culture and Society of China
★3 *(fi 6)* (either term, 3-0-0). Development of Chinese culture and society; social structure, religion, technology, economy, and polity in anthropological perspective.

O ANTHR 280 Culture and Society of Japan
★3 *(fi 6)* (either term, 3-0-0). Historical background, ethos and personality, social structure, religion, art, and modernization.

O ANTHR 283 Peoples and Cultures of Western Africa
★3 *(fi 6)* (either term, 3-0-0). The cultures of sub-Saharan West Africa and the Zaire basin.

O ANTHR 284 Peoples and Cultures of Eastern and Southern Africa
★3 *(fi 6)* (either term, 3-0-0). The indigenous cultures of the eastern portion of Africa from Ethiopia to South Africa.

O ANTHR 285 African Culture and Art
★3 *(fi 6)* (either term, 3-0-0). Analysis of the cultural and artistic heritage of Africa from Paleolithic times to the present, with emphasis on ethnographic Western and Central Africa. Offered in alternate years.

ANTHR 310 The Anthropology of Gender
★3 *(fi 6)* (either term, 3-0-0). A comparative, cross-cultural, and cross-species perspective on biological and social aspects of sex and gender differences. Prerequisite: ANTHR 110 or 207 or 209 or consent of Department. Offered in alternate years.

ANTHR 311 North American Prehistory
★3 *(fi 6)* (either term, 3-0-0). A survey of prehistory and cultural development in North America. Prerequisite: ANTHR 206 or consent of Department.

ANTHR 312 Lower Paleolithic Prehistory
★3 *(fi 6)* (either term, 3-0-0). Development of prehistoric culture in Europe, Africa and Asia during the lower Paleolithic. Prerequisite: ANTHR 206 or consent of Department. Offered in alternate years.

ANTHR 313 Middle and Upper Paleolithic Prehistory
★3 *(fi 6)* (either term, 3-0-0). Development of prehistoric culture in Europe, Africa, and Asia during the middle and upper Paleolithic. Prerequisite: ANTHR 206 or consent of Department. Offered in alternate years.

ANTHR 318 Political Anthropology
★3 *(fi 6)* (either term, 3-0-0). Introduction to modern political anthropology with emphasis on origins of state structure, relations between non-state and state societies, and problems of pluralism and stratification. Prerequisite: ANTHR 207 or consent of Department. Offered in alternate years.

ANTHR 320 Anthropology of Religion
★3 *(fi 6)* (either term, 3-0-0). Survey of anthropological approaches to religions and related phenomena including magic, taboo, shamanism and witchcraft. Emphasis on the connection between religious ideas and practices and other aspects of social life in a variety of cultures. Prerequisite: ANTHR 207 or consent of Department. Note: Not open to students with credit in ANTHR 420.

ANTHR 321 Religions of China in Practice
★3 *(fi 6)* (either term, 3-0-0). Contemporary Chinese religious culture as practiced in the family, community, voluntary associations, and the political sphere. Prerequisite: ANTHR 207 or 278 or consent of Department. Offered in alternate years.

ANTHR 322 Anthropological Perspectives on Discursive Practices
★3 *(fi 6)* (either term, 3-0-0). Cultural constructions of narrative and discourse; interethnic communication, including discourse in the courtroom, classroom, and work settings; code choice; and communication via electronic media. Prerequisite: ANTHR 208 or consent of Department. Offered in alternate years.

ANTHR 323 Ecological Anthropology
★3 *(fi 6)* (either term, 3-0-0). A consideration of the relationships between culture and the environment. Problems involving the application of basic ecological concepts and principles to human societies and evaluation of various explanatory frameworks regarding cultural adaptations. Prerequisite: ANTHR 206 or 207 or consent of Department.

ANTHR 324 Economic Anthropology
★3 *(fi 6)* (either term, 3-0-0). Introduction to the literature and controversies within the field, emphasizing systems of exchange. Prerequisite: ANTHR 207 or consent of Department. Offered in alternate years.

ANTHR 331 Anthropology of Technology
★3 *(fi 6)* (either term, 2-1s-0). An investigation into the character of contemporary technology, emphasizing theories and field methods used in the interpretation of technological change. Focus is on a different setting each term, e.g., the workplace, the internet, industrial sites, video arcades. Prerequisite: ANTHR 230, or one of 206 to 209, or consent of Department. Offered in alternate years.

ANTHR 332 Anthropology of Science
★3 *(fi 6)* (either term, 3-0-0). Contemporary views of the nature of science, including debates about science's universalism, objectives, and culture-bound epistemologies. Prerequisite: ANTHR 230, or one of 206 to 209, or consent of Department. Offered in alternate years.

ANTHR 340 Anthropological Perspectives on North American Aboriginal Peoples
★3 *(fi 6)* (either term, 3-0-0). Topics and issues in North American Aboriginal studies. Consult the Department and/or University timetable for specific topic offered in each year. Prerequisite: ANTHR 207 or 250 or consent of Department. Offered in alternate years.

ANTHR 350 Kinship and Social Structure
★3 *(fi 6)* (either term, 3-0-0). Anthropological approaches to kinship systems and other concepts of social organization, emphasizing non-western societies. Prerequisite: ANTHR 207 or 213 or consent of Department. Note: Not open to students with credit in ANTHR 351, 413, or 450. Offered in alternate years.

ANTHR 366 Theories of Culture Change
★3 *(fi 6)* (either term, 3-0-0). Theories of the nature of socio-cultural systems and the processes of change. Prerequisite: ANTHR 207 or consent of Department. Offered in alternate years.

ANTHR 367 Applied Anthropology
★3 *(fi 6)* (either term, 3-0-0). The application of anthropologists' theory and method to contemporary problems of development. Prerequisite: ANTHR 207 or consent of Department. Offered in alternate years.

ANTHR 370 Women in East Asian Societies
★3 *(fi 6)* (either term, 3-0-0). A comparative examination of women's positions and roles in East Asian societies. Effects of law, social practice, and Confucian ideology on familial and economic structures. Prerequisite: ANTHR 278, 279, or 280, or consent of Department. Offered in alternate years.

ANTHR 384 Topics in Physical Anthropology or Archaeology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 385 Topics in Social Cultural Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 390 Human Osteology
★3 *(fi 6)* (either term, 3-0-3). Lecture and laboratory study of human skeletal biology, emphasizing the identification of bones and an understanding of human functional anatomy. Prerequisite: ANTHR 209 or consent of Department.

ANTHR 391 Hominid Evolution
★3 *(fi 6)* (either term, 3-0-0). A survey of the fossil evidence for human evolution. Prerequisite: ANTHR 209 or consent of Department.

ANTHR 393 Health and Healing
★3 *(fi 6)* (either term, 3-0-0). A cross-cultural study through time of the beliefs and social activities associated with health, illness and healing. Prerequisite: ANTHR 101 or consent of Instructor.

ANTHR 396 Archaeological Field Training
★6 *(fi 12)* (Spring/Summer, 3-0-3). Instruction in all practical aspects of archaeological field techniques, including excavation, survey, recording, photography, and conservation. This course can be applied to the Canadian content requirement when held at a Canadian site. Prerequisites: ANTHR 206 or equivalent, and consent of Department.

ANTHR 397 Anthropological Field Training
★6 *(fi 12)* (Spring/Summer, 3-0-3). Students gather primary data and analyze a single community. In years when the course is held in Canada, it will fulfill Canadian content requirements. Prerequisite: ANTHR 207 or consent of Department.

ANTHR 400 Honors Seminar
★3 *(fi 6)* (first term, 0-3s-0). Contemporary issues in Anthropology, and identification and approval of an Honors thesis topic. Note: Open only to fourth year Honors students.

ANTHR 401 Ethnographic Methods
★3 *(fi 6)* (either term, 0-3s-0). Discussion of issues in methodology and field methods. Restricted to senior undergraduate students. Prerequisite: ANTHR 207 or consent of Department. Offered in alternate years.

ANTHR 407 Paleopathology
★3 *(fi 6)* (either term, 2-0-1). A detailed survey of disease processes in antiquity as expressed in skeletal and preserved tissues. Prerequisite: ANTHR 390 or consent of Department. Offered in alternate years.

ANTHR 408 Methods in Linguistic Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Topics in field methods and analytic techniques and their extensions in socio-cultural anthropology. Prerequisite: consent of Department. Offered in alternate years.

ANTHR 415 History of Anthropological Theory
★3 *(fi 6)* (either term, 3-0-0). Major theoretical trends in social and cultural anthropology in the nineteenth and twentieth centuries. Prerequisites: ANTHR 207 or 208 and a 300- or 400-level anthropology course, or consent of Department.

ANTHR 416 History of Linguistic Anthropology
★3 *(fi 6)* (either term, 3-0-0). Major theoretical trends in linguistic anthropology presented in a historical context. Prerequisite: ANTHR 208 or any other 200-level ANTHR course or consent of Department. Offered in alternate years.

ANTHR 417 Anthropology of Modernity
★3 *(fi 6)* (either term, 0-3s-0). The course investigates recent works that theorize modernity (globalization, transnationalism, the impact of new technologies) from an ethnographic perspective. Prerequisite: ANTHR 207 or 208 and a 300- or 400-level ANTHR course, or consent of Department. Offered in alternate years.

ANTHR 422 Anthropological Approaches to Verbal Art
★3 *(fi 6)* (either term, 3-0-0). A review of anthropological approaches to verbal performances in various cultures. Attention to narrative forms, including myth, folklore and oral history, and to ritual language, including oratory and prayer. Prerequisite: ANTHR 207 or 208 or consent of Department. Offered in alternate years.

ANTHR 430 Anthropological Approaches to Symbolism
★3 *(fi 6)* (either term, 3-0-0). A review of symbolic approaches in anthropology as applied to classification, ideology, ceremonial usages, forms of social action and social relationships. Prerequisite: ANTHR 207 or 320 or consent of Department. Offered in alternate years.

ANTHR 433 The Ethnographic Study of Meaning
★3 *(fi 6)* (either term, 3-0-0). An exploration of the theory and practice of 'writing culture' through consideration of classic and contemporary ethnographic monographs, together with recent contributions to contemporary cultural theory. Prerequisites: ANTHR 207 or 208 and a 300- or 400-level anthropology course, or consent of Department. Offered in alternate years.

ANTHR 436 Ethnography of Communication
★3 *(fi 6)* (either term, 1-0-2). Data collection and analysis of communicative competence, that is, how speakers interact in a given community. Prerequisite: Any 200-level course in ANTHR, or consent of Department. Offered in alternate years.

ANTHR 437 Language, Ethnicity, and Nationalism
★3 *(fi 6)* (either term, 0-3s-0). The impact of nationalism on language and culture in a variety of societies. Topics include development of national cultures and national languages; bilingualism and the creolization of language and culture; status of ethnic minorities; linguistic and cultural grounds for separatist movements; maintenance of transnational linkages in diaspora communities. Prerequisites: ANTHR 207, or 208 or consent of Department. Offered in alternate years.

ANTHR 438 Language Use and Issues in Northern Canada
★3 *(fi 6)* (either term, 0-3s-0). Languages in the Canadian North in the contemporary context. Discussion of language laws and policies in northern regions. Study of linguistic behavior in specific communities. Prerequisite: ANTHR 208 or any other 200- level ANTHR course, or consent of Department. Offered in alternate years.

ANTHR 441 Archaeometry
★3 *(fi 6)* (either term, 3-0-0). Analytical methodology for interpreting the material record of the past; structures of materials at the microscopic and macroscopic levels; raw materials and production technologies; provenance; dating; prospection; sampling and measure. Archaeological case studies are used throughout. Prerequisite: ANTHR 206 or consent of Department. Offered in alternate years.

ANTHR 445 Circumpolar Prehistory
★3 *(fi 6)* (either term, 3-0-0). A critical examination of archaeological method and theory applied to circumpolar regions. Prerequisites: ANTHR 246, one other course in anthropology, or consent of Department. Offered in alternate years.

ANTHR 446 Circumpolar Ethnology
★3 *(fi 6)* (either term, 3-0-0). A critical examination of anthropological models applied to traditional societies in the circumpolar regions. Prerequisites: ANTHR 246, one other course in anthropology, or consent of Department. Offered in alternate years.

ANTHR 450 Honors Thesis
★3 *(fi 6)* (either term, variable). Preparation of the BA Honors thesis under the supervision of an individual faculty member. Prerequisites: ANTHR 400 and consent of Department. Note: not open to students with credit in ANTHR 499.

ANTHR 463 The Origins of Food Production
★3 *(fi 6)* (either term, 0-3s-0). Archaeological evidence for the development of food production in the Old and New Worlds, discussed in the context of the major explanatory theories advanced. Prerequisite: ANTHR 206 or consent of Department. Offered in alternate years.

ANTHR 471 Readings in Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Individual research project conducted under the direction of a Department faculty member. Prerequisite: consent of Department.

ANTHR 472 Independent Research
★3 *(fi 6)* (either term, 0-0-3). Individual research project involving significant laboratory work conducted under the direction of a Department faculty member. Prerequisite: consent of Department.

ANTHR 474 Northwest Coast Societies from an Anthropological Perspective
★3 *(fi 6)* (either term, 0-3s-0). A survey of the cultures of the Northwest Coast from Yakutat Bay to the Columbia River. Cultures will be examined from the perspectives of the ethnographic present, historical change, and current developments. Focal areas include Social structure, kinship, economic systems, material culture, ethnoaesthetics, winter dance ceremonial complexes, and language. Prerequisite: ANTHR 207 or 250 or consent of Department. Offered in alternate years.

ANTHR 475 Advanced Topics in the Anthropology of Japan
★3 *(fi 6)* (either term, 0-3s-0). An examination of anthropological approaches to the study of Japan and considers how Japanese society is presented by Japanese and foreign commentators. Stereotypes of Japanese society and bases for those views are examined. Where and how changes are occurring in views of Japan and in the society itself are examined through specific topics. Offered in alternate years.

ANTHR 479 Geoarchaeology
★3 *(fi 6)* (either term, 3-0-3). Application of earth science methods to archaeological research. Prerequisite: EAS 101 or 201. Offered in alternate years.

ANTHR 481 Development of Anthropological Archaeologiy
★3 *(fi 6)* (either term, 3-0-0). A survey of approaches and practices used in archaeology before 1960; concepts and models used for interpreting archaeological data and cultural history; relation of culture historical explanations to general anthropological theory. Prerequisites: ANTHR 206 and a 300- or 400-level anthropology course, or consent of Instructor. Offered in alternate years.

ANTHR 482 Topics in Linguistic Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 484 Topics in Archaeology and/or Physical Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 485 Topics in Social and Cultural Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 486 Seminar in Archaeology and/or Physical Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 487 Seminar in Social and Cultural Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 488 Quaternary Pollen Analysis
★3 *(fi 6)* (either term, 3-0-3). Prerequisite: consent of Department. Offered in alternate years.

ANTHR 489 Seminar in Linguistic Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 490 Human Osteoarchaeology
★3 *(fi 6)* (either term, 3-0-0). The analysis and interpretation of data obtained from human skeletal and dental remains from archaeological sites. Prerequisite: ANTHR 390 or consent of Department. Offered in alternate years.

ANTHR 491 Stone Tools
★3 *(fi 6)* (either term, 3-0-0). A methodological and theoretical introduction to the analysis of stone tools. Prerequisites: ANTHR 206 and one other 400-level course in Anthropology or consent of Department. Offered in alternate years.

ANTHR 493 The Culture of Biomedicine
★3 *(fi 6)* (either term, 0-3s-0). Contemporary medical practices, health perceptions, healing systems and their relationship to contemporary North American culture. Prerequisite: ANTHR 393 or consent of Department. Offered in alternate years.

ANTHR 494 Forensic Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Human skeletal individualization and its application to human death investigation. Prerequisite: ANTHR 390 or 490 or consent of Department.

ANTHR 495 Archaeological Methods
★3 *(fi 6)* (either term, 3-0-0). The application of archaeological theory and methods to field and laboratory problems. Prerequisites: ANTHR 206 and one other 400-level course in Anthropology, or consent of Department. Offered in alternate years.

ANTHR 496 Advanced Archaeological Field Training
★6 *(fi 12)* (Spring/Summer, 0-3s-3). At a site to be selected, possibly overseas. Consult the Department and/or Spring/Summer timetable for the specific site each year. Prerequisite: ANTHR 396 or equivalent archaeological field training and consent of Department.

ANTHR 498 History of Physical Anthropology
★3 *(fi 6)* (either term, 3-0-0). A survey of the development of theory and method in physical anthropology. Prerequisites: ANTHR 209 and a 300- or 400-level anthropology course, or consent of Department. Offered in alternate years.

Graduate Courses

Note: See also INT D 594 for a course which is offered by more than one Department or Faculty and which may be taken as an option or as a course in this discipline.

ANTHR 500 MA Thesis Prospectus
★3 *(fi 6)* (either term, 0-3s-0). Preparation of a research proposal leading to the MA thesis. The prospectus will state the proposed research problem, and demonstrate the theoretical and methodological knowledge required to complete the research.

ANTHR 501 MA Colloquium
★3 *(fi 6)* (first term, 0-3s-0). Readings, presentations, and discussions of staff research, recent advances and current issues in the four fields of anthropology. Limited to new MA students

ANTHR 508 Methods in Linguistic Anthropology
★3 *(fi 6)* (either term, 0-3s-3). Topics in field methods and analytic techniques and their extensions in socio-cultural anthropology. Prerequisite: consent of Department. Offered in alternate years. Note: Not open to students with credit in ANTHR 408.

ANTHR 511 Ethnographic Field Methods I
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department. Note: Not open to students with credit in ANTHR 401 or 505. Offered in alternate years.

ANTHR 517 Anthropology of Modernity
★3 *(fi 6)* (either term, 0-3s-0). Investigates recent works that theorize modernity (globalization, transnationalism, the impact of new technologies) from an ethnographic perspective. Prerequisite: consent of Department. Offered in alternate years.

ANTHR 521 Topics in Medical Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: ANTHR 393 or 407; or consent of Department.

ANTHR 531 Traditions, Technology and Knowledge
★3 *(fi 6)* (either term, 0-3s-0). Examination of the relationships among technology, social practices and belief systems; role of technology in mediating societies' relationship with nature; and changes occurring in valued practices resulting from external perturbations. Comparison of local- and state-level systems of environmental management.

ANTHR 532 Science and Culture
★3 *(fi 6)* (either term, 0-3s-0). An examination of the perception of science in contemporary society and its formation. A review of debates concerning the theoretical positions of positivism, postmodernism, and the impact of feminist and postcolonial critiques on the formation of scientific thought. New directions within anthropology concerning cultures of science and science as culture are highlighted.

ANTHR 537 Language, Ethnicity, and Nationalism
★3 *(fi 6)* (either term, 0-3s-0). The impact of nationalism on language and culture in a variety of societies. Topics include development of national cultures and national languages; bilingualism and the creolization of language and culture; status of ethnic minorities; linguistic and cultural grounds for separatist movements; maintenance of transnational linkages in diaspora communities. Prerequisite: consent of Department. Not open to students with credit in ANTHR 437. Offered in alternate years

ANTHR 538 Language Use and Issues in Northern Canada
★3 *(fi 6)* (either term, 0-3s-0). Languages in the Canadian North in the contemporary context. Discussion of language laws and policies in northern regions. Study of linguistic behavior in specific communities. Prerequisite: ANTHR 208 or any other 200- level ANTHR course, or consent of Department. Offered in alternate years.

ANTHR 571 Advanced Readings in Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Individual research project conducted under the direction of a Department faculty member. Prerequisite: consent of Department.

ANTHR 572 Independent Research
★3 *(fi 6)* (either term, 0-0-3). Individual research project involving significant laboratory or field work conducted under the supervision of a Department faculty member. Prerequisite: consent of the Department.

ANTHR 582 Advanced Topics in Linguistic Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 584 Advanced Topics in Archaeology and/or Physical Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 585 Advanced Topics in Social and Cultural Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 586 Advanced Seminar in Archaeology and/or Physical Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 587 Advanced Seminar in Social and Cultural Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Consult the Department and/or the University timetable for the specific topic offered each year. Prerequisite: consent of Department.

ANTHR 589 Advanced Seminar in Linguistic Anthropology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 593 Evolution and Social Life
★3 *(fi 6)* (either term, 0-3s-0). Theories of the origin and evolution of the human phenotype and ecological niche, the sexual division of labor, kinship and the family, language and self-awareness. Prerequisite: consent of Department. Offered in alternate years.

ANTHR 598 Landscape and Culture
★3 *(fi 6)* (either term, 0-3s-0). Cultural experiences and representations of landscape.

ANTHR 600 PhD Thesis Prospectus
★3 *(fi 6)* (either term, 0-3s-0). Preparation of a research proposal leading to the PhD thesis. The prospectus states the proposed research problem, and demonstrates the theoretical and methodological knowledge required to complete the research.

ANTHR 601 PhD Colloquium
★3 *(fi 6)* (first term, 0-3s-0). Readings, presentations, and discussions of staff research, recent advances and current issues in the four fields of anthropology. Limited to new PhD students. Optional for students with credit in ANTHR 501

221.17 Arabic, ARAB

Department of Modern Languages and Cultural Studies
Faculty of Arts

Notes
(1) The Department reserves the right to place students in the language course appropriate to their level of language skill.
(2) Placement tests may be administered in order to assess prior background. Students with an Arabic language background should consult a Department advisor. Such students may be granted advanced placement and directed to register in a more advanced course suitable to their level of ability . Sudents seeking to fulfill their Language Other than English requirement may begin at any one appropriate level, but must take the full ★6 in one language.
(3) The Department will withhold credit from students completing courses for which prior background is deemed to make them ineligible. For example, 100-level courses are normally restricted to students with little or no prior knowledge in that language. Should a student with matriculation standing, or those possessing prior background (such as native speakers or those for whom it is their first language) register in the 100-level course, credit may be withheld.

Undergraduate Courses

ARAB 111 Beginners' Arabic I
★3 *(fi 6)* (either term, 5-0-0). Introduction to pronunciation, reading, writing, and

conversation. Note: not to be taken by students with native or near native proficiency, or Arabic 35 or its equivalents in Canada and other countries. Not open to students with credit in ARAB 100.

ARAB 112 Beginners' Arabic II
★3 *(fi 6)* (either term, 5-0-0). Continuation of ARAB 111. Prerequisite: ARAB 111 or consent of Department. Note: not to be taken by students with native or near native proficiency, or Arabic 35 or its equivalents in Canada and other countries. Not open to students with credit in ARAB 100.

ARAB 211 Intermediate Arabic I
★3 *(fi 6)* (either term, 3-0-0). Continuation of ARAB 112, emphasizing building an extensive vocabulary in everyday situations. Prerequisite: ARAB 112 or consent of Department. Note: not open to students with credit in ARAB 301 or 302.

ARAB 212 Intermediate Arabic II
★3 *(fi 6)* (either term, 3-0-0). Exercises in comprehension, translation and composition. Further study of grammar. Prerequisite: ARAB 211 or consent of Department. Note: not open to students with credit in ARAB 301 or 302.

ARAB 255 The Arab Legacy
★3 *(fi 6)* (either term, 3-0-0). Examines both representative Arabic texts in translation and samples of artistic products. No knowledge of Arabic is required. Note: This course does not fulfill the language other than English requirement.

O ARAB 499 Special Topics
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: consent of Department.

221.18 Art, ART

Department of Art and Design
Faculty of Arts

Note: Because presence at lectures and seminars, participation in classroom discussion, and the completion of assignments are important components of most courses, regular attendance is expected.

This applies particularly to studio courses where attendance is a factor in grading.

Students are expected to have successfully completed prerequisite course(s) with a minimum grade of B-. Consent of Department may be withheld in cases where the grade in a prerequisite course is below a B-.

Undergraduate Courses

ART 134 Art Fundamentals
★3 *(fi 6)* (either term, 0-6L-0). Studio-based exploration of both visual and conceptual Fine Art concerns in two- and three-dimensions. Note: ART 134 and DES 135 are required prerequisites for senior level ART or DES courses. Not open to students with credit in ART 131 or 132.

ART 136 Art Fundamentals I
★3 *(fi 6)* (first term, 0-6L-0). Studio-based exploration of both visual and conceptual Fine Art concerns in two- and three-dimensions. Note: Restricted to BFA and BDesign students.

ART 137 Art Fundamentals II
★3 *(fi 6)* (second term, 0-6L-0). Further study of studio-based exploration of both visual and conceptual Fine Art concerns in two- and three-dimensions. Note: Restricted to BFA and BDesign students.

ART 140 Drawing I
★3 *(fi 6)* (either term, 0-6L-0). Study of the principles and techniques of drawing. Note: Restricted to BFA and BDesign students. Pre- or corequisites: ART 136, 137, DES 138, 139 and consent of Department.

ART 268 Introduction to Studio
★3 *(fi 6)* (first term, 0-6L-0). Directed study in one subject embraced by ART 322. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department. Note: Restricted to students in the Faculty of Education.

ART 310 Painting: Introductory Studies I
★3 *(fi 6)* (first term, 0-6L-0). Introduction to the principles, concepts, and techniques of painting. Projects based on observation with reference to both historical and contemporary examples. Acrylic medium. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department. Note: Not open to students with credit in ART 312.

ART 311 Painting: Introductory Studies II
★3 *(fi 6)* (second term, 0-6L-0). Continued exploration of the principles, concepts and techniques of painting. Projects based on observation with reference to both historical and contemporary examples. Oil medium. Prerequisites: ART 310 and consent of Department. Note: Not open to students with credit in ART 312.

ART 316 Painting: Introductory Studies III
★3 *(fi 6)* (first term, 0-6L-0). Additional exploration in painting for students wishing more in-depth study at the introductory level. Acrylic and oil media. Pre- or corequisites: ART 310 and consent of Department. Note: Not open to students with credit in ART 313.

ART 317 Painting: Introductory Studies IV (Life Painting)
★3 *(fi 6)* (second term, 0-6L-0). Introduction to painting the figure with emphasis on working from the life model. Prerequisites: ART 310, 316; or ART 310 and prerequisite or corequisite: ART 311, and consent of Department. Note: Not open to students with credit in ART 313.

ART 322 Printmaking: Introductory Studies I
★6 *(fi 12)* (two term, 0-6L-0). Introduction to the principles and technical applications of printmaking through the study of screen printing, intaglio and relief process. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department.

ART 323 Printmaking: Introductory Studies II
★6 *(fi 12)* (two term, 0-6L-0). Further study of the principles and technical applications of screen printing, relief and intaglio processes, emphasizing the use of color. Pre- or corequisites: ART 322 and consent of Department.

ART 337 Special Projects in Studio Disciplines
★6 *(fi 12)* (two term, 0-6L-0). Special projects in studio disciplines not normally available under existing courses. Normally offered in Spring/Summer. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department.

ART 338 Special Projects in Studio Disciplines
★3 *(fi 6)* (either term, 0-6L-0). Special projects in studio disciplines not normally available under existing courses. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department.

ART 339 Special Projects in Drawing
★6 *(fi 12)* (two term, 0-6L-0). Special drawing projects not normally available under existing courses. Note: BFA and BDesign students may use ART 339 in lieu of ART 140/340 upon consent of Department. Offered in Spring/Summer only. Prerequisites: ART 134 and DES 135, or ART 136 and DES 138 and consent of Department.

ART 340 Drawing II
★3 *(fi 6)* (either term, 0-6L-0). Development and application of techniques and concepts of drawing with emphasis on drawing from the life model. Note: Restricted to BFA and BDesign students. Prerequisite: ART 140.

ART 361 Sculpture: Introductory Studies in Abstract Sculpture
★3 *(fi 6)* (either term, 0-6L-0). Foundation studies in abstract sculpture. Prerequisites: ART 134 and DES 135, or ART 136 and DES 138 and consent of Department. Corequisite: Normally ART 362, to be taken in the same academic year. Not open to students with credit in ART 362 ★6 offered prior to 1992/93.

ART 362 Sculpture: Introductory Studies in Figurative Sculpture
★3 *(fi 6)* (either term, 0-6L-0). Foundation studies in figurative sculpture. Prerequisites: ART 134 and DES 135, or ART 136 and DES 138, and consent of Department:. Corequisite: Normally ART 361, to be taken in the same academic year. Not open to students with credit in ART 362 ★6 offered prior to 1992-93.

ART 363 Sculpture: Introductory Studies III
★6 *(fi 12)* (two term, 0-6L-0). Further foundation studies in sculpture. Pre- or corequisites: ART 361 and 362 and consent of Department.

ART 410 Painting: Intermediate Studies I
★3 *(fi 6)* (first term, 0-6L-0). A project based course exploring principles, concepts and techniques of painting. Prerequisites: ART 310, 311 and consent of Department. Note: Not open to students with credit in ART 412.

ART 411 Painting: Intermediate Studies II
★3 *(fi 6)* (second term, 0-6L-0). Further study of advanced principles, concepts and techniques of painting, leading to self-initiated projects. Prerequisites: ART 410 and consent of Department. Note: Not open to students with credit in ART 412.

ART 418 Painting: Intermediate Figure Studies I
★3 *(fi 6)* (first term, 0-6L-0). Further study in painting the figure with emphasis on painting from the life model. Prerequisites: ART 310, 311, 317, and prerequisite or corequisite ART 410 and consent of Department. Note: Not open to students with credit in ART 414.

ART 419 Painting: Intermediate Figure Studies II
★3 *(fi 6)* (second term, 0-6L-0). Further study in painting the figure with emphasis on painting from the life model. Prerequisites: ART 418 and consent of Department. Note: Not open to students with credit in ART 414.

ART 422 Printmaking: Intermediate Studies I
★6 *(fi 12)* (two term, 0-6L-0). Study of the principles and technical applications of printmaking with an emphasis on lithography and etching. Prerequisites: ART 322 and consent of Department.

ART 423 Printmaking: Intermediate Studies II
★6 *(fi 12)* (two term, 0-6L-0). Further study of the principles and technical applications of lithography and etching with emphasis on the use of color. Pre- or corequisites: ART 422 and consent of Department.

ART 425 Word and Image: Intermediate Projects in Printmaking for Artists and Designers
★6 *(fi 12)* (two term, 0-6L-0). Exploration of the multiple relationships between

word and image generated through consideration of text. Prerequisite: ART 322. Corequisite: ART 422. Note: ART 425 and DES 425 will be taught in conjunction. Registration priority given to BDesign Printmaking Route students registering in DES 425. Not open to students who have successfully completed DES 425.

ART 437 Special Projects in Studio Disciplines
★6 *(fi 12)* (two term, 0-6L-0). Special projects in studio disciplines not normally available under existing courses. Normally offered in Spring/Summer. Prerequisite: consent of Department.

ART 438 Special Projects in Studio Disciplines
★3 *(fi 6)* (either term, 0-6L-0). Special projects in studio disciplines not normally available under existing courses. Prerequisite: consent of Department.

ART 439 Special Projects in Drawing: Intermediate
★6 *(fi 12)* (two term, 0-6L-0). Normally offered in Spring/Summer. Prerequisites: ART 140 and 340, or 339 and consent of Department.

ART 440 Drawing: Intermediate Studies
★3 *(fi 6)* (first term, 0-6L-0). Further study and application of the techniques and concepts of drawing. Note: Restricted to BFA and BDesign students. Prerequisite: ART 339 or ART 340.

ART 441 Drawing: Intermediate Studies
★3 *(fi 6)* (second term, 0-6L-0). Further study and application of techniques and concepts of drawing. Note: Restricted to BFA and BDesign students. Prerequisite: ART 440. Not open to students with credit in ART 440 (★6) offered prior to 1995/96.

ART 450 Installation Art: Intermediate Studies
★3 *(fi 6)* (either term, 0-6L-0). Study and application of techniques and concepts of installation art. Prerequisites: a minimum of ★12 in 300-level ART courses, and consent of Department.

ART 462 Sculpture: Intermediate Studies I
★6 *(fi 12)* (two term, 0-6L-0). Intermediate studies in sculpture. Prerequisites: ART 361 and 362 and/or consent of Department.

ART 463 Sculpture: Intermediate Studies II
★6 *(fi 12)* (two term, 0-6L-0). Further intermediate studies in sculpture. Prerequisite or corequisite: ART 462 and/or consent of Department.

ART 510 Painting: Advanced Studies I
★3 *(fi 6)* (first term, 0-6L-0). Individual directed study in a studio/workshop environment. Prerequisites: ART 410, 411 and consent of Department. Note: Not open to students with credit in ART 512.

ART 511 Painting: Advanced Studies II
★3 *(fi 6)* (second term, 0-6L-0). Individual directed study in a studio/workshop environment. Prerequisites: ART 510 or 516 and/or consent of Department. Note: Not open to students with credit in ART 512.

ART 516 Painting: Advanced Studies III
★3 *(fi 6)* (first term, 0-6L-0). Individual directed study in a studio/workshop environment. Prerequisites: ART 410, 411 and consent of Department. Note: Not open to students with credit in ART 513.

ART 517 Painting: Advanced Studies IV
★3 *(fi 6)* (second term, 0-6L-0). Individual directed study in a studio/workshop environment. Prerequisites: ART 510 or 516 and/or consent of Department. Note: Not open to students with credit in ART 513.

ART 518 Painting: Advanced Figure Studies V
★3 *(fi 6)* (first term, 0-6L-0). Individual directed study in a studio/workshop environment emphasizing the human figure as subject matter. Prerequisites: ART 418, 419 and prerequisite or corequisite: ART 510 or 516 and/or consent of Department. Note: Not open to students with credit in ART 514.

ART 519 Painting: Advanced Figure Studies VI
★3 *(fi 6)* (second term, 0-6L-0). Individual directed study in a studio/workshop environment emphasizing the human figure as subject matter. Prerequisites: ART 518 or ART 418, 419 and one of ART 510, 516 and/or consent of Department. Note: Not open to students with credit in ART 514.

ART 522 Printmaking: Advanced Studies I
★6 *(fi 12)* (two term, 0-6L-0). Advanced study of the principles and technical applications of printmaking emphasizing mixed media and photographic techniques. Prerequisites: ART 422 and consent of Department.

ART 523 Printmaking: Advanced Studies II
★6 *(fi 12)* (two term, 0-6L-0). Continued advanced study of the principles and technical applications of printmaking emphasizing individual development. Pre- or corequisites: ART 522 and consent of Department.

ART 524 Printmaking: Advanced Studies III
★6 *(fi 12)* (two term, 0-6L-0). Advanced individual study of drawing and other image-making processes and their application in printmaking. Pre- or corequisites: ART 523 and consent of Department.

ART 525 Word and Image: Advanced Projects in Printmaking for Artists and Designers
★6 *(fi 12)* (two term, 0-6L-0). Exploration of the multiple relationships between word and image generated through consideration of text. Prerequisite: ART 422 and ART 425. Corequisite: ART 522. Note: ART 525 and DES 525 are taught in conjunction. Registration priority given to BDesign Printmaking Route students registering in DES 525. Not open to students who have successfully completed DES 525.

ART 537 Special Projects in Studio Disciplines
★6 *(fi 12)* (two term, 0-6L-0). Special projects in studio disciplines not normally available under existing courses. Normally offered in Spring/Summer. Prerequisite: consent of Department.

ART 538 Special Projects in Studio Disciplines
★3 *(fi 6)* (either term, 0-6L-0). Special projects in studio disciplines not normally available under existing courses. Prerequisite: consent of Department.

ART 539 Special Projects in Drawing: Advanced
★6 *(fi 12)* (two term, 0-6L-0). Normally offered in Spring/Summer. Prerequisites: ART 439, or ART 440 and 441, and consent of Department.

ART 540 Drawing: Advanced Studies
★3 *(fi 6)* (first term, 0-6L-0). Prerequisite: ART 439, or ART 440 and 441. Note: Restricted to BFA and BDesign students.

ART 541 Drawing: Advanced Studies
★3 *(fi 6)* (second term, 0-6L-0). Prerequisite: ART 540. Note: Restricted to BFA and BDesign students. Not open to students with credit in ART 540 (★6) offered before 1995/96.

ART 550 Installation Art: Advanced Studies
★3 *(fi 6)* (either term, 0-6L-0). Prerequisites: ART 450 or ★12 in 400-level ART courses, and consent of Department.

ART 562 Sculpture: Advanced Studies I
★6 *(fi 12)* (two term, 0-6L-0). Advanced studies in sculpture. Prerequisite: ART 462 and/or consent of Department.

ART 563 Sculpture: Advanced Studies II
★6 *(fi 12)* (two term, 0-6L-0). Further advanced studies in sculpture. Prerequisite or corequisite: ART 562 and/or consent of Department.

ART 564 Sculpture: Advanced Studies III
★6 *(fi 12)* (two term, 0-6L-0). Additional advanced studies in sculpture. Prerequisite or corequisite: ART 563 and/or consent of Department.

Graduate Courses

ART 612 Painting: Concepts, Analysis, and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 613 Painting: Development of Concepts, Analysis, and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 622 Printmaking: Concepts, Analysis, and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 623 Printmaking: Development of Concepts, Analysis and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 630 Seminar in Related Disciplines
★3 *(fi 6)* (either term, 0-2s-0).

ART 640 Drawing: Concepts, Analysis and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 641 Drawing: Development of Concepts, Analysis and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 662 Sculpture: Concepts, Analysis, and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

ART 663 Sculpture: Development of Concepts, Analysis, and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

221.19 Art dramatique, ADRAM

Faculté Saint-Jean

Cours de 1er cycle

O ADRAM 101 Introduction à l'art théâtral
★3 *(fi 6)* (l'un ou l'autre semestre, 2-0-2). Les origines et le développement de l'art théâtral, notions de base sur la production d'un spectacle de théâtre: de la conception à la réalisation. Analyses critiques de pièces auxquelles les étudiants assistent.

O ADRAM 103 Les procédés dramatiques
★3 *(fi 6)* (l'un ou l'autre semestre, 2-0-2). Approche pratique et théorique au développement des ressources humaines par l'art dramatique. Introduction au jeu et à la forme théâtrale, avec insistance sur le processus de création, la stimulation des capacités de communiquer et de s'exprimer, l'imagination, la spontanéité. La découverte de l'improvographie.

O ADRAM 201 Survol historique du théâtre universel
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Styles et formes du spectacle théâtral et leur relation changeante entre l'espace de jeu et le public, à partir du théâtre grec et romain jusqu'à nos jours. Oeuvres majeures, artistes et artisans du théâtre qui ont aidé au développement du langage théâtral tel que nous le connaissons aujourd'hui. Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits en ADRAM 301.

ADRAM 302 Survol historique du théâtre canadien
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Évolution du théâtre canadien des origines jusqu'à nos jours; vue d'ensemble contemporaine sur l'histoire du théâtre, dans laquelle les auteurs dégagent les étapes qui allaient amener les Canadiens à s'exprimer totalement dans cet art; évaluation critique des spectacles auxquels les étudiants assistent.

ADRAM 484 Création
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Théorie et pratique du processus créatif dans l'écriture; introduction aux procédés discursifs de la poésie, du roman et de la pièce de théâtre. Préalable(s): FRANC 235 et ★3 de littérature de niveau 300. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits en FRANC 484.

221.20 Art History, ART H

Department of Art and Design
Faculty of Arts

Note: Because presence at lectures and seminars, participation in classroom discussion, and the completion of assignments are important components of most courses, students serve their best interest by regular attendance.

This particularly applies to seminars in the History of Art and Design, and Visual Culture where attendance is a factor in grading.

Undergraduate Courses

L ART H 101 History of Art, Design, and Visual Culture I
★3 *(fi 6)* (either term, 3-0-0). Introduction to Western Art, Design and Visual Culture to the end of the 14th century.

L ART H 102 Hstory of Art, Design and Visual Culture II
★3 *(fi 6)* (either term, 3-0-0). Introduction to Western Art, Design and Visual Culture from the 15th century to the present.

ART H 201 Survey of Early Christian to Ottonian Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts in Europe and the Mediterranean basin from the third to the 11th century.

ART H 202 Survey of Renaissance Art I
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the 15th and 16th centuries in Northern Europe.

ART H 203 Survey of Northern Baroque Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the 17th century in Northern Europe.

ART H 204 Survey of 18th-Century Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of Europe during the 18th century.

ART H 205 Survey of 19th-Century Art I
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the first half of the 19th century in Europe.

ART H 206 Survey of 20th-Century Art I
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts up to World War II in Europe and North America.

ART H 207 Survey of Early Canadian Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts from the 17th century to the end of the 19th century in Canada.

ART H 209 Survey of the History of Design
★3 *(fi 6)* (either term, 3-0-0). Introduction to the development of design since the Industrial Revolution.

ART H 210 Survey of the History of Photography
★3 *(fi 6)* (either term, 3-0-0). A study of photography from its invention in the 19th century to its impact in the 20th century.

ART H 249 Visual Culture and Advertising
★3 *(fi 6)* (either term, 3-0-0). The history of visual advertising practices from the late 19th century to the present.

ART H 251 Survey of Romanesque and Gothic Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts in Europe from the 11th to the 14th century.

ART H 252 Survey of Renaissance Art II
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the 15th and 16th centuries in Italy.

ART H 253 Survey of Southern Baroque Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the 17th century in Southern Europe.

ART H 255 Survey of 19th-Century Art II
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the second half of the 19th century in Europe.

ART H 256 Survey of 20th-Century Art II
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the 20th century from World War II to the present, in Europe and North America.

ART H 257 Survey of 20th-Century Canadian Art
★3 *(fi 6)* (either term, 3-0-0). History of the visual arts of the 20th century in Canada.

ART H 400 Topics in Theory and Criticism
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ART H 406 Topics in Art from the Beginning of the 20th Century
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 206 with a minimum grade of B-.

ART H 407 Topics in Early Canadian Art
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 207 with a minimum grade of B-.

ART H 409 Topics in the History of Design
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 209 with a minimum grade of B-.

ART H 410 Topics in the History of Photography and Related Aspects of Representation
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 210 with a minimum grade of B-.

ART H 411 Special Topics in Art History
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ART H 418 Special Subject, Fourth-Year Honors
★6 *(fi 12)* (two term, 0-3s-0). Preparation of the Honors essay, required in the fourth year of the Honors Program.

ART H 430 Topics in Museum Studies in Visual and Material Culture I
★3 *(fi 6)* (either term, 0-3s-0). Theoretical and practical aspects of museology. Prerequisite: consent of Department.

ART H 431 Topics in Museum Studies in Visual and Material Culture II
★3 *(fi 6)* (either term, 0-3s-0). Contemporary issues in museology. Prerequisite: consent of Department.

ART H 449 Topics in Visual Culture and Advertising
★3 *(fi 6)* (either term, 0-3s-0). Students are expected to have successfully completed ART H 249 with a minimum grade of B-. Prerequisite: consent of Department.

ART H 455 Topics in Art from the Second Half of the 19th Century
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 255 with a minimum grade of B-.

ART H 456 Topics in Art from the Second Half of the 20th Century
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 256 with a minimum grade of B-.

ART H 457 Topics in 20th-Century Canadian Art
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Instructor. Students are normally expected to have successfully completed ART H 257 with a minimum grade of B-.

Graduate Courses

ART H 505 Advanced Studies in Art from the First Half of the 19th Century
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 506 Advanced Studies in Art from the First Half of the 20th Century
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 507 Advanced Studies in Early Canadian Art
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 509 Advanced Studies in the History of Design
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 510 Topics in the History of Photography and Related Aspects of Representation
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 511 Special Topics in Art History
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 549 Advanced Studies in Visual Culture and Advertising
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 555 Advanced Studies in Art from the Second Half of the 19th Century
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 556 Advanced Studies in Art from the Second Half of the 20th Century
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 557 Advanced Studies in Canadian Art in the 20th Century
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 560 Advanced Studies in Theories of Museology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ART H 561 Advanced Studies in Theories of Exhibition
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

ART H 562 Museum Studies Internship
★3 *(fi 6)* (either term, 0-6L-0). Supervised internships in an Edmonton area or other approved institution. Prerequisite: ART H 560, 561, an approved graduate-level research methodology course and consent of Department.

ART H 563 Advanced Studies in Museum Management Strategies
★3 *(fi 6)* (either term, 0-3s-0). Not offered every year. Prerequisite: consent of Department.

ART H 564 Advanced Studies in Cultural Tourism in Museums, and the Globalization of Visual and Material Culture
★3 *(fi 6)* (either term, 0-3s-0). Not offered every year. Prerequisite: consent of Department.

ART H 565 Advanced Studies in the Museum and Aboriginal Issues
★3 *(fi 6)* (either term, 0-3s-0). Not offered every year. Prerequisite: consent of Department.

ART H 566 Advanced Studies in Museum Contexts
★3 *(fi 6)* (either term, 0-3s-0). Not offered every year. Prerequisite: consent of Department.

ART H 567 Advanced Studies in Museums and Multi-Media
★3 *(fi 6)* (either term, 0-3s-0). Not offered every year. Prerequisite: consent of Department.

ART H 568 Advanced Studies in Communications and Marketing the Museum
★3 *(fi 6)* (either term, 0-3s-0). Not offered every year. Prerequisite: consent of Department.

ART H 600 Historiography and Methodology
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

ART H 611 Special Topics in Art History
★3 *(fi 6)* (either term, 0-3s-0). Intended for MA (History of Art, Design, and Visual Culture) students. Prerequisite: consent of Department.

221.21 Astronomy, ASTRO

Department of Physics
Faculty of Science

Undergraduate Courses

O ASTRO 120 Astronomy of the Solar System
★3 *(fi 6)* (first term, 3-0-0). The development of astronomy and astronomical techniques, including results obtained from the latest orbiting observatories. The origin, evolution and nature of the Earth, the other planets and non-planetary bodies will be discussed. Viewing experience will be available using the campus observatory. Prerequisites: Pure Mathematics 30 and Physics 30.

O ASTRO 122 Astronomy of Stars and Galaxies
★3 *(fi 6)* (second term, 3-0-0). The development of our understanding of the universe, including current models of stellar evolution and cosmology. Emphasis on understanding the physical processes underlying astronomical phenomena. Viewing experience will be available using the campus observatory. Prerequisites: Pure Mathematics 30 and Physics 30.

O ASTRO 320 Stellar Astrophysics I
★3 *(fi 6)* (either term, 3-0-0). Application of physics to stellar formation and stellar evolution; theoretical models and observational comparisons of main sequence stars, white dwarf stars, neutron stars, supernovae, black holes; binary star systems, stellar atmospheres and stellar spectra. Prerequisites: MATH 115, PHYS 126 or 146, 208. In lieu of PHYS 208, PHYS 271 may be taken as a corequisite. Some additional knowledge of astronomy (ASTRO 120 and/or 122) would be advantageous.

O ASTRO 322 The Stellar Environment, Galaxies, and Cosmology
★3 *(fi 6)* (either term, 3-0-0). The interstellar medium and interstellar reddening; galactic structure; kinematics and dynamics of stars in galaxies; quasars; introduction of cosmology. Prerequisites: MATH 115, PHYS 126 or 146, and one of PHYS 208 or 271. Some additional knowledge of astronomy (ASTRO 120 and/or 122) would be advantageous.

O ASTRO 429 Upper Atmosphere and Space Physics
★3 *(fi 6)* (either term, 3-0-0). Basic space plasma pheonema: the Earth's plasma and field environment; the solar cycle; generation of the solar wind; the interplanetary plasma and field environment; the solar-terrestrial interaction; magnetospheric substorms; the aurora borealis; magnetosphere-ionosphere interactions; effects of magnetospheric storms on man-made systems; use of natural electromagnetic fields for geophysical exploration. Pre- or corequisite: PHYS 381.

O ASTRO 430 Physical Cosmology
★3 *(fi 6)* (either term, 3-0-0). Observational cosmology; geometry and matter content of the Universe; physical processes in the early stages of the Universe; inflation, Big Bang nucleosynthesis and the cosmic microwave background radiation; cosmological aspects of galaxy formation and the growth of large-scale structure. Prerequisites: PHYS 211, 351, MATH 334.

O ASTRO 465 Stellar Astrophysics II
★3 *(fi 6)* (either term, 3-0-0). Stellar interiors and nuclear transformations; energy transport; model stars; variable stars; stellar evolution. Prerequisites: PHYS 211, 271, ASTRO 320, MATH 334. Note: Credit may be obtained for only one of PHYS 465 or ASTRO 465.

221.22 Biochemistry, BIOCH

Department of Biochemistry
Faculty of Medicine and Dentistry

Undergraduate Courses

Notes
(1) BIOCH 200, 310, 320, 330, 401, 410, 420, 430, 441, 450, 455, 460 can be used by students in the Faculty of Science as science courses.
(2) Courses in clinical biochemistry are listed under Medical Laboratory Science.

O BIOCH 200 Introductory Biochemistry
★3 *(fi 6)* (either term, 3-0-0). An introduction to the fundamental principles of biochemistry. Protein structure and function; lipids and the structure of biological membranes; nucleotides and the structure of nucleic acids; bioenergetics and the metabolism of carbohydrates, lipids, and nitrogen; the integration and regulation of cellular metabolism. Prerequisites: CHEM 101 and CHEM 161 or 261. Notes: (1) This course is designed for students who require a one-term introduction to the fundamental principles of biochemistry and for students who intend to take further courses in biochemistry. (2) BIOCH 200 may not be taken for credit if credit has already been obtained in any of BIOCH 203, 205, or 220.

BIOCH 310 Bioenergetics and Metabolism
★3 *(fi 6)* (first term, 3-0-0). Designed to enable rigorous study of the molecular mechanisms in bioenergetics and metabolism. It covers: the principles of bioenergetics; the reactions and pathways of carbohydrate, lipid, and nitrogen metabolism, and their regulation; oxidative phosphorylation and photophosphorylation; carbohydrate biosynthesis in plants; the integration and hormonal regulation of mammalian metabolism. Prerequisites: BIOCH 200, CHEM 102, and 263. Notes: (1) Students with grades of less than B- in prerequisite courses require consent of department. (2) This course may not be taken for credit if credit has already been obtained in BIOCH 203 or 205.

BIOCH 320 Structure and Catalysis
★3 *(fi 6)* (either term, 3-0-0). Designed to illustrate, in detail, the relationships between structure and function in biological molecules. It covers: the structure of proteins; techniques used to study proteins; contractile proteins and immunoglobulins as illustrations of protein function; enzyme catalysis, kinetics, and regulation; structural carbohydrates and glycobiology; the structure of lipids;

biological membranes and mechanisms of transport; molecular mechanisms in biosignalling. Prerequisites: BIOCH 200, CHEM 102, and 263. Notes: (1) Students with grades of less than B- in prerequisite courses require consent of department. (2) This course may not be taken for credit if credit has already been obtained in BIOCH 203 or 205.

BIOCH 330 Nucleic Acids and Molecular Biology
★3 *(fi 6)* (second term, 3-0-0). Provides students with a comprehensive introduction to the biochemistry of nucleic acids. It covers: the structure and properties of nucleotides and nucleic acids; DNA-based information technologies; genes and chromosome structure; molecular mechanisms in DNA replication, repair, and recombination; RNA metabolism; protein synthesis and targeting; the regulation of gene expression. Prerequisites: BIOCH 200, CHEM 102, and 263. Notes: (1) Students with grades of less than B- in prerequisite courses require consent of department. (2) This course may not be taken for credit if credit has already been obtained in BIOCH 203 or 205.

BIOCH 401 Biochemistry Laboratory
★6 *(fi 12)* (two term, 0-0-8). Laboratory course in modern biochemical techniques. Designed for Biochemistry Honors and Specialization students in their third or fourth year. Other interested students may enrol subject to space limitations. Prerequisites: BIOCH 320 and 330 with minimum grades of B-, and consent of Department.

L BIOCH 410 Signal Transduction and Metabolic Regulation
★3 *(fi 6)* (second term, 3-0-0). Principles of metabolic regulation by hormones and external agonists through signal transduction processes and protein modification. Biochemistry of cellular communication, coordination of carbohydrate, lipid, nucleotide and protein metabolism. Prerequisites: BIOCH 310, 320 and 330 with minimum grades of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not register for credit (see BIOCH 510).

L BIOCH 420 Protein Chemistry, Structure, and Function
★3 *(fi 6)* (second term, 3-0-0). Protein chemistry and purification. The intra- and intermolecular forces that determine protein structure. Principles of protein folding and dynamics. Enzyme mechanisms and ligand binding interactions. Prerequisite: BIOCH 320 with a minimum grade of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not register for credit (see BIOCH 520).

L BIOCH 430 Biochemistry of Eukaryotic Gene Expression
★3 *(fi 6)* (first term, 3-0-0). The organization and expression at the molecular level of information encoded in the nucleic acids of eukaryotic cells. The focus will be on genome structure and the regulation of gene expression at the levels of transcription, post-transcriptional processing, translation, post-translational modification and protein sorting. Recombinant DNA technologies and genetic engineering will be discussed as methods for studying the cellular processing of genetic information. Prerequisites: BIOCH 330 with a minimum grade of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not register for credit (see BIOCH 530).

L BIOCH 441 Structure and Function of Biological Membranes
★3 *(fi 6)* (first term, 3-0-0). Survey of the structure and function of biological membranes. Topics include the structure, properties and composition of biomembranes, characterization and structural principles of membrane lipids and proteins, lateral and transverse asymmetry, dynamics, lipid-protein interactions, membrane enzymology, permeability, and biogenesis. Prerequisites: BIOCH 320 with a minimum grade of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not register for credit (see BIOCH 541).

L BIOCH 450 The Molecular Biology of Mammalian Viruses
★3 *(fi 6)* (first term, 3-0-0). This course will focus on virus structure, replication, and interaction with host cells at the molecular level. Lytic viruses with single- or double-stranded DNA or RNA genomes will be discussed, as will the mechanisms of viral oncogenesis. Prerequisites: BIOCH 320 and 330 with minimum grades of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not register for credit (see BIOCH 550).

L BIOCH 455 Biochemistry of Lipids and Lipoproteins
★3 *(fi 6)* (second term, 3-0-0). Advanced course focusing on specific aspects of the regulation of lipid and lipoprotein metabolism. Topics include the transcriptional and post-transcriptional mechanisms governing the synthesis and degradation of important enzymes, lipids, and lipid transport molecules; the role of lipid mediators in signaling pathways and protein modification; the assembly and dynamics of lipoproteins and biological membranes; genetic disruptions of lipid regulatory proteins such as cell surface receptors leading to human disease. Prerequisites: BIOCH 310, 320 and 330 with minimum grades of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not register for credit (see BIOCH 555).

L BIOCH 460 Physical Biochemistry
★3 *(fi 6)* (second term, 3-0-0). Survey of physical techniques used in the characterization and structural determination of biological macromolecules. Topics include hydrodynamics, optical and magnetic resonance spectroscopies, diffraction techniques such a X-ray crystallography, and small angle neutron and X-ray scattering. Emphasis is on using these techniques in evaluating structure-function relationships by a discussion of representative macromolecular systems. Prerequisites: BIOCH 320 with a minimum grade of B-, or consent of Department. Offered in alternate years. Intended for undergraduate students. Graduate students may not resister for credit (see BIOCH 560).

BIOCH 498 Advanced Laboratory
★3 *(fi 6)* (either term, 0-0-4). An advanced laboratory course for undergraduate students enrolled in Honors or Specialization Biochemistry who wish to engage in individual research. Enrolment is limited to students whose performance is exceptional (e.g., GPA of 3.3 or greater). Can be taken as a science elective but not as a substitute for required courses in Biochemistry. Prerequisites: BIOCH 401 and consent of Course Coordinator. Not to be taken by students with credit in former BIOCH 501.

BIOCH 499 Honors Research Project
★6 *(fi 12)* (two term, 0-0-8). Supervised research within a laboratory in the Department of Biochemistry, to be carried out over both terms of Fall/Winter. The results of the research project will be presented in a final written report and an oral presentation. Prerequisite: Students enrolled in this course will normally be in their graduating year in the Honors program in Biochemistry.

Graduate Courses

BIOCH 510 Signal Transduction and Metabolic Regulation
★3 *(fi 6)* (second term, 3-0-0). `Principles of metabolic regulation by hormones and external agonists through signal transduction processes and protein modification. Biochemistry of cellular communication, coordination of carbohydrate, lipid, nucleotide, and protein metabolism. Prerequisites: BIOCH 310, 320 and 330 with minimum grades of B-, or consent of Department. Offered in alternate years. Lectures are the same as for BIOCH 410, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 410.

BIOCH 520 Protein Chemistry, Structure, and Function
★3 *(fi 6)* (second term, 3-0-0). Protein chemistry and purification. The intra- and intermolecular forces determining protein structure. Principles of protein folding and dynamics. Enzyme mechanisms and ligand binding interactions. Prerequisites: BIOCH 320 with a minimum grade of B-, or consent of Department. Offered in alternate years. Lectures are the same as for BIOCH 420, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 420.

BIOCH 530 Biochemistry of Eukaryotic Gene Expression
★3 *(fi 6)* (first term, 3-0-0). This course will consider the organization and expression at the molecular level of information encoded in the nucleic acids of eukaryotic cells. The focus will be on genome structure and the regulation of gene expression at the levels of transcription, post-transcriptional processing translation, post-translational modification, and protein sorting. Recombinant DNA technologies and genetic engineering will be discussed as methods for studying the cellular processing of genetic information. Prerequisites: BIOCH 330 with a minimum grade of B-, or consent of Department. Offered in alternate years. Lectures are the same as for BIOCH 430, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 430.

BIOCH 541 Structure and Function of Biological Membranes
★3 *(fi 6)* (first term, 3-0-0). Survey of the structure and function of biological membranes. Topics include the structure, properties, and composition of biomembranes, characterization and structural principles of membrane lipids and proteins, lateral and transverse asymmetry, dynamics, lipid-protein interactions, membrane enzymology, permeability, and biogenesis. Prerequisites: BIOCH 320 with a minimum grade of B-, or consent of Department. Offered in alternate years. Lectures are the same as for BIOCH 441, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 441.

BIOCH 550 The Molecular Biology of Mammalian Viruses
★3 *(fi 6)* (first term, 3-0-0). This course will focus on virus structure, replication, and interaction with host cells at the molecular level. Lytic viruses with single- or double stranded DNA or RNA genomes will be discussed, as will the mechanisms of viral oncogenesis. Prerequisites: BIOCH 320 and 330 with minimum grades of B-, or consent of Department. Offered in alternate years. Lectures are the same as for BIOCH 450, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 450.

BIOCH 555 Biochemistry of Lipids and Lipoproteins
★3 *(fi 6)* (first term, 3-0-0). Advanced course focusing on specific aspects of the regulation of lipid and lipoprotein metabolism. Topics include transcriptional and post-transcriptional mechanisms governing the synthesis and degradation of important enzymes, lipids, and lipid transport molecules; the role of lipid mediators in signaling pathways and protein modification; assembly and dynamics of lipoproteins and biological membranes; genetic disruptions of lipid regulatory proteins such as cell surface receptors leading to human disease. Prerequisite: BIOCH 310, 320 and 330 with minimum grades of B-, or consent of Department.

Offered in alternate years. Lectures are the same as for BIOCH 455, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 455.

BIOCH 560 Physical Biochemistry
★3 *(fi 6)* (second term, 3-0-0). Survey of the physical techniques used in the characterization and structural determination of biological macromolecules. Topics include hydrodynamics, optical and magnetic resonance spectroscopies, diffraction techniques such as X-ray crystallography, and small angle neutron and X-ray scattering. Emphasis will be placed on the utility of these techniques in evaluating structure-function relationships by a discussion of representative macromolecular systems. Prerequisites: BIOCH 320 with a minimum grade of B-, or consent of Department. Offered in alternate years. Lectures are the same as for BIOCH 460, but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in BIOCH 460.

BIOCH 609 Macromolecular Structure Analysis
★3 *(fi 6)* (second term, 3-0-0). Principles of X-ray crystallography as applied to the study of protein and nucleic acid structure. Practical aspects of diffraction and structure solution are demonstrated by a collaborative study of a suitable small molecule of biological interest. Designed for senior honors and graduate students. Prerequisite: consent of Instructor. Maximum enrolment of 10 students. Offered in alternate years.

BIOCH 620 Selected Topics in Protein Structure, Function, and Regulation
★3 *(fi 6)* (second term, 0-3s-0). Directed reading and seminar course, based on papers taken from recent literature of protein research. Students critically discuss the papers and give oral presentations to the class. Designed for graduate students. Prerequisite: BIOCH 420 or equivalent, or consent of Department.

BIOCH 623 Special Topics in Research on Polynucleotides
★2 *(fi 4)* (two term, 0-1s-0). This course is a journal club and discussion group in which current research topics on nucleic acids are discussed. Specific talks range from biochemistry, genetics and microbiology to nuclear biology and clinical aspects.

BIOCH 626 Special Topics in Protein Research
★2 *(fi 4)* (two term, 0-1s-0). Seminar course for advanced students. Detailed consideration is given to recent advances in research on protein structure and function and mechanism of enzyme action. Prerequisite: BIOCH 420 or consent of Department.

BIOCH 630 Selected Topics in Modern Molecular Biology
★3 *(fi 6)* (second term, 0-3s-0). Directed reading and seminar course, based on papers taken from the recent literature of molecular biology. Students critically discuss the papers and give oral presentations. Note: designed for graduate students; offered yearly. Prerequisite: BIOCH 530 and consent of the Department.

BIOCH 640 Special Topics in Research on Biomembranes
★2 *(fi 4)* (two term, 0-1s-0). Seminar course for advanced students covering selected topics from the current literature in the field of membrane structure and function. Prerequisite: BIOCH 441 or consent of Department.

BIOCH 641 Selected Topics on the Structure and Function of Biological Membranes
★3 *(fi 6)* (first term, 0-3s-0). Directed reading and seminar course on the structure and function of biological membranes. Topics include membrane biogenesis, bioenergetics, transport and structural aspects of membrane lipids and proteins. Prerequisite: BIOCH 441 or consent of the Department. Offered in alternate years.

BIOCH 650 Signal Transduction
★2 *(fi 4)* (two term, 0-1s-0). A journal club and discussion group addressing topics in the general area of signalling mechanisms that control cell activation, growth, apoptosis and vesicle trafficking. Specific talks range from biochemistry, genetics and microbiology to molecular biology and clinical aspects. Prerequisite: BIOCH 410/510 or consent of Department.

BIOCH 651 Special Topics in Lipid and Lipoprotein Research
★2 *(fi 4)* (two term, 0-1s-0). Seminar for advanced students covering selected topics from the current literature in the field of lipid and lipoprotein research. Prerequisite: BIOCH 555 or consent of Department.

BIOCH 655 Advances in Lipid and Lipoprotein Research
★3 *(fi 6)* (second term, 1-2s-0). Recent developments and use of the current literature are emphasized. Topics include regulation of lipid metabolism, intracellular lipid trafficking, regulation of lipoprotein secretion, lipid transfer among lipoproteins, reverse cholesterol transport, and atherosclerosis. Prerequisite: BIOCH 455, or 555, or consent of Department. Offered in alternate years.

BIOCH 670 Recent Advances in Biochemistry
★4 *(fi 8)* (two term, 0-2s-0). A seminar course on topics of current interest in Biochemistry. Note: Open to first-year graduate students in Biochemistry only.

BIOCH 671 Recent Advances in Biochemistry
★4 *(fi 8)* (two term, 0-2s-0). A seminar course on topics of current interest in Biochemistry. Note: Open to second-year Graduate students in Biochemistry only. Prerequisite: BIOCH 670.

BIOCH 675 Magnetic Resonance in Biology and Medicine II
★3 *(fi 6)* (second term, 3-0-0). Designed for advanced honors and graduate students interested in the application of nuclear magnetic resonance spectroscopy to biological systems. Topics include quantum mechanical basis of NMR, multinuclear multidimensional NMR experiments, NMR relaxation theory, new NMR applications. Prerequisite: consent of Instructor. Offered in alternate years.

221.23 Biochimie, BIOCM

Faculté Saint-Jean

Cours de 1er cycle

BIOCM 203 Introduction à la biochimie I
★3 *(fi 6)* (premier semestre, 3-0-0). Structure et chimie de la cellule; structure et fonction des protéines; cinétique enzymatique; chimie des glucides, métabolisme intermédiaire. Préalable(s): CHIM 101; CHIM 161 ou 261; et CHIM 163 ou 263. Notes: (1) Les étudiants ayant obtenu une note inférieure à C+ dans un de ces cours devront obtenir la permission de l'instructeur avant de s'inscrire. (2) Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour BIOCH 201 ou BIOCH 220.

BIOCM 205 Introduction à la biochimie II
★3 *(fi 6)* (deuxième semestre, 3-0-0). Chimie et métabolisme des lipides, acides aminés et nucléotides; structure et assemblage des membranes; biologie moléculaire des acides nucléiques. Préalable(s): BIOCH 203. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour BIOCH 201.

221.24 Bioinformatics, BIOIN

Department of Biological Sciences
Faculty of Science

Undergraduate Courses

L BIOIN 301 Bioinformatics I
★3 *(fi 6)* (first term, 3-0-3). Introduction to computational tools and databases used in the collection and analysis of sequence data and other analytical data from high-throughput molecular biology studies. Students will use existing tools, learn the underlying algorithms and their limitations, and will write programs to perform bioinformatic analysis. Prerequisites: CMPUT 115 and GENET 270. (Offered jointly by the Departments of Computing Science and Biological Sciences). [Biological Sciences].

L BIOIN 401 Bioinformatics II
★3 *(fi 6)* (second term, 3-0-3). Advanced topics in bioinformatics will be covered. A major part of the course will be devoted to team-based projects involving writing novel bioinformatics tools to deal with current problems in bioinformatics. Prerequisites: BIOIN 301, a 300-level CMPUT course and a 300-level GENET course. (Offered jointly by the Departments of Computing Science and Biological Sciences). [Biological Sciences].

221.25 Biologie, BIOLE

Faculté Saint-Jean

Cours de 1er cycle

BIOLE 107 Introduction à la biologie cellulaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-3). Introduction à la structure et au fonctionnement de la cellule. Les principaux sujets étudiés comprendront l'origine de la vie, le développement des lignées procaryotes et eucaryotes, la bioénergétique, les fonctions biochimiques à l'intérieur de la cellule et la communication entre les cellules. Le contrôle génétique des activités cellulaires est examiné au moyen des protocoles de l'analyse génétique moléculaire et de leurs applications au génie génétique et à la biotechnologie. Préalable(s): Biologie 30 et Chimie 30.

BIOLE 108 Les organismes et leur environnement
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-3). Une introduction aux divers organismes de cette planète et comment ils ont été affectés par leur environnement et comment l'environnement est présentement le produit de l'activité d'organismes. Sera étudié également comment l'évolution a produit, sur une longue période de temps, les principaux groupes d'organismes et comment les origines de l'évolution ont affecté leur classification. Les principes sous-jacents à notre connaissance des principales lignées seront étudiés en se servant d'exemples de bactéries, de mycétes, de protistes, de plantes et d'animaux. Préalable(s): Biologie 30.

BIOLE 201 Biologie cellulaire des eucaryotes
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Une dissection structurale et fonctionnelle

de la cellule eucaryote. Détection de molécules spécifiques au niveau ultrastructural; structure et fonction de la membrane plasmique; rôle du cytosquelette dans le transport intracellulaire, la mitose et la cytocinèse; le système endomembranaire, le ciblage des protéines, l'exocytose et l'endocytose; structure et fonction du noyau; contrôle du cycle cellulaire et cancer. Préalable(s): BIOLE 107. Préalable(s) ou concomitant(s): CHIM 161 ou 261. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour CELL 201.

BIOLE 207 La génétique moléculaire et l'hérédité
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-3). Les principes chromosomiques et moléculaires de la transmission et du fonctionnement des gènes; la construction de cartes génétiques et physiques des gènes et des génomes; les protocoles utilisés pour isoler des gènes spécifiques. Seront aussi à l'étude les exemples de mécanismes régulateurs pour l'expression de matériel génétique chez les procaryotes et les eucaryotes. Préalable(s): BIOLE 107.

BIOLE 208 Les principes de l'écologie
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-3). L'écologie est l'étude scientifique des interactions entre les organismes et leur environnement selon une hiérarchie de niveaux d'organisation: les individus, les populations, les communautés et les écosystèmes. Destiné à donner à l'étudiant une vue générale des concepts de base en écologie, ce cours peut aussi servir de préparation à des cours plus avancés. L'emphase dans les laboratoires sera sur le recueil, l'analyse et l'interprétation des données provenant d'expériences écologiques afin d'illustrer et compléter les notes du cours. Les exemples seront tirés d'une vaste étendue d'organismes et de systèmes. Préalable(s): BIOLE 108.

BIOLE 315 Histoire et théorie de la biologie
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Aperçu des découvertes biologiques des temps les plus reculés jusqu'à maintenant et des principales idées nées des sciences de la vie ou les influençant, et ce par rapport aux événements sociaux, historiques et culturels. Recommandé aux étudiants qui se spécialisent dans les sciences biologiques mais accessible à tous les étudiants qui s'intéressent à l'histoire de la science et de son importance dans le développement de la culture. Préalable(s): Un cours de niveau 300 en science biologique ou l'approbation du Vice-doyen aux affaires académiques.

BIOLE 321 Mécanismes de l'évolution
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Les principales caractéristiques du processus évolutif, incluant les données fossiles, les fondements de la génétique des populations, la sélection naturelle, l'adaptation et la spéciation. Préalable(s): BIOLE 108 et 207.

221.26 Biology (Biological Sciences), BIOL

Department of Biological Sciences
Faculty of Science

Notes
(1) See the following sections for listings of other Biological Sciences courses: Bioinformatics (BIOIN); Botany (BOT); Entomology (ENT); Genetics (GENET); Microbiology (MICRB); Zoology (ZOOL).
(2) See the following sections for listings of other relevant courses: Interdisciplinary Studies (INT D); Immunology and Infection (IMIN); Marine Science (MA SC); Paleontology (PALEO).

Undergraduate Courses

L BIOL 107 Introduction to Cell Biology
★3 *(fi 6)* (either term, 3-1s-3). An introduction to cell structure and function. Major topics include the molecules and structures that comprise prokaryotic and eukaryotic cells, the mechanisms by which energy is harvested and used by cells, how cells reproduce, and how information is stored and used within a cell via the processes of DNA replication, transcription, and translation. Prerequisites: Biology 30 and Chemistry 30. Note: BIOL 107 is not a prerequisite for BIOL 108. BIOL 107 and 108 can be taken in either term.

L BIOL 108 Introduction to Biological Diversity
★3 *(fi 6)* (either term, 3-1s-3). Examines the major lineages of life on Earth. Overview of evolutionary principles and classification, the history of life, and the key adaptations of prokaryotes, protists, fungi, plants, and animals. Laboratories survey the diversity of biological form and function, and introduce students to data collection and scientific writing. Prerequisite: Biology 30. Note: BIOL 107 is not a prerequisite for BIOL 108. BIOL 107 and 108 can be taken in either term.

L BIOL 201 Eukaryotic Cellular Biology
★3 *(fi 6)* (either term, 3-0-0). A structural and functional dissection of a eukaryotic cell. Detection of specific molecules at the ultrastructural level; plasma membrane structure and function; cytoskeleton involvement in intracellular transport, mitosis, and cytokinesis; the endomembrane system, protein targeting, exocytosis and endocytosis; nuclear structure and function; cell cycle control and cancer. Prerequisite: BIOL 107. Prerequisite or corequisite: CHEM 161 or 261. Note: Not to be taken by students with credit in CELL 201, in addition, not available to students currently enrolled in CELL 201.

L BIOL 207 Molecular Genetics and Heredity
★3 *(fi 6)* (either term, 3-1s-3). The chromosomal and molecular basis for the transmission and function of genes. The construction of genetic and physical maps of genes and genomes. Strategies for the isolation of specific genes. Examples of regulatory mechanisms for the expression of the genetic material in both prokrayotes and eukaryotes. Prerequisite: BIOL 107.

L BIOL 208 Principles of Ecology
★3 *(fi 6)* (either term, 3-1s-3). Ecology is the scientific study of interactions between organisms and their environment in a hierarchy of levels of organization: individuals, populations, communities, and ecosystems. Provides a comprehensive survey of general concepts that can stand alone or serve as preparation for advanced courses in ecology. Labs emphasize collection, analysis, and interpretation of data from ecological experiments and field studies to illustrate and complement lecture material. Examples are drawn from a broad range of organisms and systems. Prerequisite: BIOL 108. Open to students in the BSc Forestry and BSc Forest Business Management program once they have completed REN R 120 and ENCS 201.

BIOL 299 Research Opportunity Program
★1.5 *(fi 3)* (either term, 0-0-3). A credit/no-credit course for supervised participation in a faculty research project. Normally taken after completion of a minimum of 30 but not more than 60 units of course weight in a program in the Faculty of Science. Prerequisite: GPA of 2.5 or higher, a 100 or 200 level course in the field of research and consent of Department. Normally taken in addition to a full course load. Project and course information available at ROP website or Department of Biological Sciences. Note: Application does not guarantee an ROP position. Credit may be obtained twice.

BIOL 314 Biology of Bryophytes
★3 *(fi 6)* (first term, 3-0-3). Hornworts, liverworts and mosses (bryophtes) are basal groups of land plants that are pivotal in the evolution, adaptation, and diversification of life in terrestrial environments. In addition, their diminutive size, relative structural simplicity and a dominant haploid generation have made bryophytes useful as model organisms for studies of plant function, development, and molecular biology. Lectures and labs will explore the biological diversity and provide a phylogenetic overview of these groups with an emphasis on species found in western Canadian environments. Prerequisite: BIOL 108 and a 200-level Biological Sciences course. BOT 205 and BOT 210 recommended. May not be taken for credit if credit already obtained in BOT 305.

L BIOL 315 Biology: An Historical Perspective
★3 *(fi 6)* (second term, 3-0-0). An outline of the scientific foundations of biological discovery to the mid-20th century. Students must have a sophisticated understanding of modern concepts in biology, be prepared to write two major essays on focused topics and participate actively in class discussion. Prerequisite: Students registered in their 3rd year with credit in at least one 300-level course in the biological sciences.

L BIOL 321 Mechanisms of Evolution
★3 *(fi 6)* (first term, 3-0-0). Discusses the major features of the evolutionary process, including the fossil record, basic population genetics, variation, natural selection, adaptation, and speciation. Prerequisites: BIOL 108 and 207.

BIOL 330 Introduction to Biological Data
★3 *(fi 6)* (first term, 3-0-3). Expands on prior introductions to the scientific method and examines the steps involved in the planning, collection, organization, analysis and presentation of biological data. Classes will explore the types of data used to answer a variety of biological questions and will review several different sampling designs, assess the benefits and limitations of various data types for scientific inference, and integrate the statistical methods that are common to other introductory courses. Labs will teach students how spreadsheets and relational databases can be used to manipulate, analyze, and present the results of scientific research. Prerequisite: BIOL 208 and STAT 151.

L BIOL 331 Population Ecology
★3 *(fi 6)* (second term, 3-0-3). Principles of population ecology as they apply to plants and animals; population consequences of variation among individuals; habitat structure and population structure; habitat selection and foraging theory; life tables, demography, and the evolution of life history patterns; population dynamics; interactions among organisms (predation, competition, mutualism); and population regulation. Prerequisites: BIOL 208; any one of MATH 113, 115 or 120; STAT 151.

BIOL 332 Community Ecology
★3 *(fi 6)* (second term, 3-3s-0). Principles of community ecology, applied to plants and animals. The nature of communities, functional groups and rarity; niche theory and competition; disturbance and other alternatives to competition; food webs (predation, herbivory and disease); diversity (determinants, functional consequences and gradients); island communities. Prerequisites: BIOL 208; STAT 151; and any one of MATH 113, 115, or 120. Offered in alternate years. May not be taken for credit if credit already obtained in ZOOL 332.

L BIOL 333 Wetland Ecology and Management
★3 *(fi 6)* (first term, 3-0-3). Introduction to the ecology of wetland ecosystems, communities and plants. Major topics include landscape features, hydrological and chemical cycles of wetlands, wetland communities and major flora and fauna.

Emphasis will be on wetlands in Western Canada including the bog, fen and marsh systems in boreal Alberta, prairie and montane wetlands. Loss or alteration of wetlands due to human activity is documented. A field trip is required. Prerequisite: BIOL 108 and a 200-level Biological or Earth Sciences course. Credit may be obtained in only one of BOT 333 and BIOL 333.

L BIOL 335 Principles of Systematics
★3 *(fi 6)* (second term, 3-0-0). An introduction to the principles, methods, and applications of biological systematics, including reconstruction of phylogenies, creation of synthetic and cladistic classifications, historical interpretation of geographic distributions, and applications in evolutionary biology. Each student will analyze phylogenetic data and write a description of a species and its relationships. Prerequisites: BIOL 108 and a 200-level Biological Sciences course.

L BIOL 340 Global Biogeochemistry
★3 *(fi 6)* (second term, 3-0-0). An introduction to biogeochemical cycles in the environment. Discusses processes and reactions governing cycles in the atmosphere, lithosphere, terrestrial ecosystems, freshwater wetlands and lakes, river estuaries, and the oceans. Outlines the global cycles of water, carbon, nitrogen, phosphorus, and sulfur. Group discussions will incorporate current topics in anthropogenic alterations of natural cycles that lead to ecosystem degradation. Prerequisites: CHEM 101 and BIOL 208; MICRB 265 strongly recommended.

L BIOL 361 Marine Science
★3 *(fi 6)* (second term, 3-0-0). An introduction to marine science and marine biology including history of marine exploration, essential features of the physical marine environment, a survey of major marine communities and adaptations of the organisms that live in each, overviews of selected groups of marine organisms (e.g., marine mammals), and human impact on the oceans. Recommended as preparation for courses offered through the Bamfield Marine Station (see courses listed under MA SC). Prerequisite: ZOOL 250 or BIOL 208.

L BIOL 364 Freshwater Ecology
★3 *(fi 6)* (first term, 3-1s-0). An introduction to the ecology of freshwater ecosystems. Lectures will examine the roles of biota in ecological patterns and processes in lakes, ponds, rivers, and streams, emphasizing north-temperate and boreal regions. Seminars will focus on recent papers from the primary literature. Designed to stand-alone or to provide a biological complement to BIOL 464. Prerequisite: BIOL 208.

L BIOL 366 Northern Ecology
★3 *(fi 6)* (second term, 3-0-0). Examines the ecology of boreal, arctic, and alpine ecosystems, including postglacial history, climate, geology, nutrient cycling and energy flow in forests, wetlands, lakes and marine systems, animal and plant adaptations to cold and current human impacts. Prerequisite: BIOL 208.

L BIOL 367 Conservation Biology
★3 *(fi 6)* (first term, 3-0-0). This course introduces the principles of conservation biology with an emphasis on ecological processes operating at population, community and ecosystem levels of organization. Threats to biological diversity, ranging from species introductions to habitat destruction will be discussed along with conservation solutions ranging from the design of protected areas through conservation legislation. Prerequisite: BIOL 208. Credit cannot be obtained in both BIOL 367 and ENCS 364.

L BIOL 380 Genetic Analysis of Populations
★3 *(fi 6)* (second term, 3-1s-0). Application of molecular biology to the study of systematics, structure of natural populations, mating systems, and forensics. Among the topics discussed are molecular techniques used to detect genetic variation in natural populations, methods to construct phylogenies using molecular data, mathematical models of population structure, paternity analysis, and DNA fingerprinting. Prerequisite: BIOL 207.

L BIOL 381 Pollution Biology
★3 *(fi 6)* (first term, 3-0-0). The ecological impact of natural and anthropogenic pollutants on aquatic and terrestrial ecosystems. The major groups of environmental pollutants and the phenomenon of long-range transport of pollutants are used as an introduction to several important global pollution problems. Lectures deal specifically with acid precipitation, metals in the environment, stratospheric ozone depletion, and the greenhouse effect, exploring effects on plants at the biochemical, physiological, ecological, and ecosystem levels. This background is then used to discuss issues such as forest decline, multiple plant stresses, biomagnification, global diversity, economics and politics of pollution control, progress toward pollution control, and progress toward pollution abatement. Prerequisite: A 200-level Biological Sciences course.

BIOL 391 Techniques in Molecular Biology and Bioinformatics
★3 *(fi 6)* (either term, 0-1s-6). A laboratory course introducing students to techniques in gene manipulation, protein expression and bioinformatics by following a gene through a thematic series of molecular manipulations. Intended as a companion course to GENET 390. Restricted to Honors and Specialization students in Biological Sciences or consent of Department. Pre- or corequisite: GENET 390. Not to be taken by students with credit in GENET 420, in addition, not available to students currently enrolled in GENET 420.

BIOL 400 Industrial Internship Practicum
★3 *(fi 6)* (either term, 0-3s-0). Required by all students who have just completed a Biological Sciences Industrial Internship Program. Must be completed during the first academic term following return to full-time studies. Note: A grade of F to A+ will be determined by the student's job performance as evaluated by the employer, by the student's performance in the completion of an internship practicum report, and by the student's ability to learn from the experiences of the Internship as demonstrated in an oral presentation. Prerequisite: WKEXP 942 or 943.

L BIOL 430 Experimental Biology
★3 *(fi 6)* (either term, 3-0-3). Emphasis is on the design of experiments and analysis of data collected from field and laboratory studies in Biology. Prerequisites: STAT 141 or 151 and a 300-level Biological Sciences course.

BIOL 432 Methods in Plant Ecology
★3 *(fi 6)* (first term, 1-0-3). A field/laboratory course in which students will be introduced to common techniques used in plant ecology. Topics covered will include reproductive ecology, plant competition, field sampling, seed ecology, and community analysis. Prerequisites: BOT 332, STAT 151, and any university MATH course. The laboratory component includes field trips and independent research projects. Offered in alternate years.

L BIOL 433 Plant-Animal Interactions
★3 *(fi 6)* (second term, 3-1s-0). Plants and animals have a long co-evolutionary history, and this course explores many of the ways in which plants and animals use and abuse each other. Specific topics include pollination biology, herbivory, and dispersal. Emphasis is on both the evolutionary ecology and ecological implications of these interactions. The seminar component consists of weekly discussions of related literature. Prerequisite: BIOL 331 or BOT 332 or ZOOL 332. Offered in alternate years.

BIOL 450 The Ecology of Below-Ground Communities
★3 *(fi 6)* (first term, 3-0-3). Survey of diversity and interactions among below-ground organisms, including trophic relationships, competition, facilitation and mutualism; adaptations of soil organism; causes and consequences of soil organism diversity. Laboratory sessions include identification of soil invertebrates, and field and laboratory methods for studying the ecology of below-ground organisms. Offered in alternate years. Prerequisite: BIOL 208 and consent of the instructor.

L BIOL 464 Limnology
★3 *(fi 6)* (second term, 3-0-3). Discussion of physical and chemical regimes in lakes, ecology of various aquatic organisms, calculation of hydraulic and chemical budgets, models used in lake management, and lake management problems such as acid rain and eutrophication. Prerequisite: A 300-level Biological Sciences course (BIOL 364 recommended) and ★6 in University level Chemistry. Credit may be obtained for only one of ZOOL 464 and BIOL 464.

L BIOL 468 Problems in Conservation Biology
★3 *(fi 6)* (second term, 3-0-0). Seminar and reading course dealing with current problems in conservation biology. Prerequisite: BIOL 367 or ZOOL 465 or ENCS 364 and consent of Department. Credit cannot be obtained for BIOL 468 by students who already have credit for ZOOL 468.

L BIOL 470 Landscape Ecology
★3 *(fi 6)* (second term, 3-0-3). Landscapes are holistic entities whose patterns influence ecological processes. Topics highlighted in this course include landscape components, morphology and dynamics; detecting spatial/temporal change in landscapes; issues of scales; movements of organisms, disturbances, and nutrients across landscape mosaics; and restoration, planning and management in a landscape context. Labs emphasize GIS applications to characterizing landscape patterns and heterogeneity in space and time, distributing and moving organisms across landscapes, and restoring or planning landscapes for conservation objectives. Prerequisites: MATH 115; STAT 151; one of BIOL 331, 332 or BOT 332. Previous GIS course is useful. Consent of instructor is required.

L BIOL 490 Individual Study
★3 *(fi 6)* (either term, 0-0-6). Registration will be contingent on the student's having made prior arrangements with a faculty member willing to supervise the program. Credit may be obtained more than once. Prerequisite: A 300-level Biological Sciences course and consent of the Department.

BIOL 495 Special Topics in Biology
★3 *(fi 6)* (either term, 0-3s-0). Covers specialized topics of current interest to advanced undergraduates in Biological Sciences. Consult the Department for details about current offerings. Prerequisite: consent of instructor. Credit for this course may be obtained more than once.

L BIOL 498 Research Project
★3 *(fi 6)* (either term, 0-0-6). Directed research in laboratory of an assigned member of the Biological Sciences Department. Credit may be obtained more than once. Prerequisites: A 300-level Biological Sciences course and consent of the Department.

L BIOL 499 Research Project
★6 *(fi 12)* (two term, 0-0-6). Directed research in the laboratory of an academic staff member of the Biological Sciences Department. Successful completion of this course requires an oral presentation and a written report on the research project. Prerequisite: A 300-level Biological Sciences course and the signature of either the program advisor or the Associate Chair, Undergraduate Studies. Note:

Students in Honors in Biological Sciences are required to successfully complete BIOL 499.

Graduate Courses

Notes

(1) All 300- and 400-level courses in the Department of Biological Sciences may be taken for credit (except for BIOL 490, 498 and 499) by graduate students with approval of the student's supervisory committee.

(2) The following courses may be taken as an option in graduate programs in the Department of Biological Sciences with approval of the student's supervisor or supervisory committee: BIOCH 510, 520, 530, 541, 550, 555, 560; CHEM 361, 363, 461; CELL 300, 301; IMIN 371, 372, 452; INT D 421; MA SC 400, 401, 402, 410, 412, 420, 425, 430, 437, 440, 445, 470, 480; MMI 405, 415, 520; NEURO 472; NU FS 363; PALEO 318, 319; PHARM 601.

BIOL 506 Systematics and Evolution Forum
★2 *(fi 4)* (either term, 1-1s-0). Lectures and discussions on a variety of subjects in systematics and evolutionary biology by graduate students, staff, and visiting speakers. Credit may be obtained more than once. Prerequisite: consent of instructors for students not registered in the systematics and evolution graduate program.

BIOL 507 Seminars in Systematics and Evolution
★1 *(fi 2)* (either term, 0-1s-0). Seminars in systematics and evolutionary biology. Credit may be obtained more than once. Prerequisite: consent of instructors for students not registered in the systematics and evolution graduate program.

BIOL 508 Current Problems in Systematics and Evolution
★3 *(fi 6)* (either term, 0-2s-0). Lectures or structured discussions on a selected topic in systematics and evolutionary biology. Credit may be obtained more than once. Prerequisite: consent of instructors for students not registered in the Systematic and Evolution program.

BIOL 520 Advanced Phylogenetic Analysis
★3 *(fi 6)* (first term, 3-0-3). Theory, techniques and applications of phylogenetic inference, with an emphasis on molecular data. Topics to be covered include: tree inference methods, methods for assessing the reliability of phylogenetic reconstruction, and applications and practical issues in phylogenetic analysis. Labs emphasize practical experience in phylogenetic analysis. The final grade will be based on a course project and presentation. Prerequisite: BIOL 335 or consent of Instructor. Preference will be given first to graduate students in Systematics and Evolution, and then to graduate students in Biological Sciences; advanced undergraduates are welcome if space is available. Offered in alternate years.

BIOL 545 Current Topics in Animal and Cell Physiology
★3 *(fi 6)* (first term, 0-3s-0). Survey, discussion and evaluation of literature dealing with current advances and selected topics in animal and cell physiology. Credit in this course can be obtained more than once. Enrolment of students by consent of instructor. Normally offered in alternate years.

BIOL 560 Current Problems in Ecology
★3 *(fi 6)* (either term, 0-3s-0). Seminar and reading on current problems concerning selected aspects of ecology. More than one section may be available and topics change from year to year. Please consult the Department for current information. Credit for this course may be obtained more than once. Prerequisite: at least one 400-level ecology course.

BIOL 570 Models in Ecology
★3 *(fi 6)* (second term, 0-3s-1). Formulation, analysis, parameterization, and validation of quantitative models for ecological processes. Applications include population dynamics, species interactions, movement, and spatial processes. Approaches include classical hypothesis testing, computer simulation, differential equations, individual-based models, least squares, likelihood, matrix equations, Markov processes, multiple working hypotheses, and stochastic processes. The lab covers computer simulation methods. Prerequisite: consent of Instructor. Offered in alternate years.

BIOL 595 Special Topics in Biology
★3 *(fi 6)* (either term, 0-3s-0). Covers specialized topics of current interest to graduate students in Biological Sciences. Consult the Department for details about current offerings. Prerequisite: consent of instructor. Credit for this course may be obtained more than once.

BIOL 601 Philosophy, Sociology, and Politics of Science
★3 *(fi 6)* (first term, 3-0-0). Influences of current philosophical concepts, and the sociological and political realities, on biological research and teaching. Offered in alternate years. Credit for this course may be obtained more than once.

BIOL 603 Advanced Ecology
★3 *(fi 6)* (either term, 0-3s-0). Designed for new graduate students in environmental biology to foster critical thinking and discussion and to introduce them to issues of experimental design and analysis and different approaches to ecology. The course involves student discussion of papers, lectures by faculty members on their research, seminars by students and a written assignment. Prerequisite: consent of instructor. Preference will be given to students in Biological Sciences.

BIOL 631 Seminar in Ecology
★1 *(fi 2)* (either term, 0-2s-0). Credit may be obtained more than once.

BIOL 633 Advanced Techniques in Biology
★1 *(fi 2)* (either term, 0-2s-0). This course will cover specialized topics of current interest to graduate students in Biological Sciences with an emphasis on learning new research skills. Prerequisite: consent of Instructor. Credit for this course may be obtained more than once.

BIOL 642 Seminar in Physiology and Cell Developmental Biology
★1 *(fi 2)* (either term, 0-2s-0). Credit may be obtained more than once.

221.27 Biomedical Engineering, BME

Department of Biomedical Engineering
Faculty of Medicine and Dentistry

Note: See also EE BE 512 and 540 which may be taken as courses in this discipline.

Undergraduate Courses

O BME 210 Elementary Human Anatomy and Physiology
★3 *(fi 6)* (first term, 3-0-0). Introduction to basic anatomy and physiology of the human body for engineers. The objective is to present the various levels of structural organization of the body from chemical, through cellular and tissue organization to whole body structure and maintenance. The role of physical principles and phenomena as they are known to exist and apply to living systems is highlighted in engineering terms in preparation for BME 310. Intended for undergraduate students in the Faculty of Engineering. Students from other faculties must obtain the consent of the Department of Biomedical Engineering.

O BME 310 Introduction to Biomedical Engineering and Biomedical Systems Modelling
★3 *(fi 6)* (second term, 3-0-0). Introduces the broad field of biomedical engineering while focussing on the quantitative methods and modelling in key areas that emphasize the similarities between biomedical and conventional engineering science. Topics could include but may not be restricted to electrical properties of excitable tissue, particularly nerve and muscle, biofluid mechanics of the cardiovascular system, control of human posture and locomotion. Intended primarily for undergraduate students of the Engineering program. Students from other faculties must obtain the consent of the Department of Biomedical Engineering. Prerequisite: BME 210.

Graduate Courses

O BME 513 Imaging Methods in Medicine
★3 *(fi 6)* (second term, 3-0-0). Introduction to basic physical and technological aspects of medical imaging. Emphasis on computed transmission and emission tomography, magnetic resonance, and ultrasound imaging. These methods are developed and contrasted in terms of how imaging information is generated, detected, and processed and how different hardware configurations and other factors limit image quality. Relative diagnostic potential of the imaging methods is also discussed in relation to future prospects of each method.

BME 529 Statistics for Biomedical Engineering
★3 *(fi 6)* (second term, 3-0-0). This course is intended to be practical rather than theoretical, and is directed toward biomedical engineering students. Topics consist of two-sample comparisons using t-tools and alternatives; analysis of variance and multiple comparison procedures; linear regression models; time series models; tools for multivariate data; logistic regression; elements of research design. An attempt will be made to tailor examples and, if possible, topics to students' areas of interest. Prerequisite: an introductory course in statistics and consent of Department. Available to students in a biomedical engineering program only except by special permission.

BME 530 Topics in Biomedical Engineering
★3 *(fi 6)* (either term, 3-0-0). Individual sections covering such topics as signal processing and rehabilitation engineering. Prerequisite: consent of Instructor.

BME 541 Biomaterials in Medicine
★3 *(fi 6)* (first term, 3-0-0). This course is intended for graduate and advanced undergraduate students interested in biomaterials science. Students from the faculties of Medicine, Pharmacy and Pharmaceutical Sciences, and Engineering are suitable to participate in this course. The first half of the course concentrates on biomaterials currently used in medicine. The second half of the course aims to familiarize the students with the current research activity in the field. Prerequisite: consent of Instructor.

O BME 553 Rehabilitation Engineering: Assisted Movement after Injury
★3 *(fi 6)* (second term, 3-0-3/2). Introduction to rehabilitation techniques for assisting individuals with physical disabilities to reach, stand and walk. Biomechanics of intact and pathological movements and the use of assistive devices such as exoskeletal orthotics, neuroprosthetic devices and locomotor training are emphasized. Students are trained in biomechanical modeling, motion analysis,

electrical stimulation, control systems, neuroregeneration, and pharmacology. Students also have the opportunity to participate in clinical case demonstrations and gain experience in human movement measurement and analysis techniques. Prerequisite: BME 210, 310 and consent of instructor.

BME 555 Anatomy and Physiology for Engineers
★3 *(fi 6)* (second term, 3-0-0). A broad view of human anatomy and physiology, particularly as it pertains to biomedical engineering and bioinstrumentation. Certain aspects of human pathology are discussed to emphasize the range of adaptations possible in biological structure and function. Prerequisite: consent of Department. Available to students in a biomedical engineering program only except by special permission.

BME 564 Fundamentals of Magnetic Resonance Imaging, MRI
★3 *(fi 6)* (second term, 3-0-0). Designed for graduate and advanced undergraduate students requiring a thorough grounding in the fundamentals of imaging by means of nuclear magnetic resonance, NMR. Topics include the principles of nuclear magnetic resonance as applied to imaging, image processing, imaging techniques for achieving specific types of contrast, image artifacts, and typical applications. Prerequisite: consent of Instructor.

BME 579 Topics in Medical Physics
★3 *(fi 6)* (either term, 3-0-0). Individual sections dealing with such topics as computed tomography, nuclear magnetic resonance, therapeutic radiation. Prerequisite: consent of Instructor.

BME 599 Project in Biomedical Engineering
★3 *(fi 6)* (either term, 0-0-6). Practical application of science to problems in health care; involves report on problem and alternative solutions, plus complete demonstration and documentation of chosen solution. Prerequisite: Any BME course and consent of Department.

BME 600 Seminars in Biomedical Engineering
★2 *(fi 4)* (two term, 0-1s/2-0). Series of seminars exposing graduate students to the various areas of research and providing a forum for progress reports in individual areas. Seminars by research workers from inside and outside the University are included. Seminars are informal with ample opportunity for discussion.

BME 630 Advanced Topics in Biomedical Engineering
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: consent of Department.

BME 675 Magnetic Resonance in Biology and Medicine
★3 *(fi 6)* (first term, 3-0-0). Physical principles behind the application of nuclear magnetic resonance spectroscopy in fields from biochemistry to medicine. Topics include Fourier transform NMR, multipulse techniques, two-dimensional NMR, relaxation theory, in vivo spectroscopy, NMR imaging. Designed for advanced students interested in the application of NMR to biological systems. Offered in alternate years. Prerequisite: consent of Instructor.

BME 679 Advanced Topics in Medical Physics
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: consent of Department.

221.28 Botany (Biological Sciences), BOT

Department of Biological Sciences
Faculty of Science

Notes
(1) See the following sections for listings of other Biological Sciences courses: Bioinformatics (BIOIN); Biology (BIOL); Entomology (ENT); Genetics (GENET); Microbiology (MICRB); Zoology (ZOOL).
(2) See the following sections for listings of other relevant courses: Interdisciplinary Studies (INT D); Immunology and Infection (IMIN); Marine Science (MA SC); Paleontology (PALEO).

Undergraduate Courses

L BOT 205 Fundamentals of Plant Biology
★3 *(fi 6)* (first term, 3-0-3). An overview of the diversity and biology of organisms traditionally included in the Plant Kingdom (algae, fungi, lichens, mosses, ferns, gymnosperms and flowering plants). Emphasis throughout the course is on the relationship between structural and functional innovations in plants and how these have influenced their reproduction and evolution in various ecosystems. Symbioses and co-evolutionary relationships between or among different kinds of plants, and with other groups of organisms, are also considered. Prerequisite BIOL 108.

L BOT 210 Biology of Land Plants
★3 *(fi 6)* (second term, 3-0-3). Comparative survey of vascular plants and bryophytes focusing on their morphology, classification and phylogeny. Emphasis on living plant groups with some paleobotanical evidence presented. Prerequisite: BIOL 108.

L BOT 240 Whole Plant Physiology
★3 *(fi 6)* (first term, 3-0-3). Introductory general course on water and energy relations, evapotranspiration, mineral nutrition, membrane transport, ascent of sap, translocation, net assimilation, growth, development, hormone action, and stress. Prerequisites: BIOL 107; CHEM 101 or 161 or 263.

L BOT 303 Plant Development
★3 *(fi 6)* (second term, 3-0-3). The generation of a functional plant requires the spatially coordinated acquisition of numerous cell identities. Examines developmental processes in plants at the molecular and cellular level and will cover: body axis establishment and tissue pattern formation during embryogenesis, cell-to-cell communication in patterning events and differentiation processes, and cell differentiation patterns in tissue systems. Emphasis throughout the course will be on current research using developmental mutants. Prerequisites: BIOL 201 and 207; one of BOT 205, 210 or 240 strongly recommended.

L BOT 306 Biology of the Fungi
★3 *(fi 6)* (second term, 3-0-3). The Kingdom Fungi, including yeast, molds, mushrooms, rusts, smuts, mildews, etc., is one of the most diverse groups of living organisms and plays important roles in nutrient cycling in ecosystems, pathogenesis in plants and animals, industrial processes, etc. This course offers a systematic overview of the morphology and ecology of fungi and the relevance of these organisms to human affairs. Laboratories offer a selection of fungi for detailed study and permit students to develop and identify pure cultures of fungi from soil, wood and other materials. Prerequisites: BIOL 108 and a 200-level Biological Sciences course. BOT 205 recommended.

BOT 308 Plant Anatomy
★3 *(fi 6)* (first term, 3-0-3). Seed plant structure and development with particular emphasis on flowering plants. The course covers origin, development, and function of meristems (apical, primary, and lateral), tissue and organ development, wood structure and identification, floral anatomy, embryogenesis, and fruit structure. Prerequisites: BIOL 108. BOT 205 recommended. May not be taken for credit if credit already obtained in BOT 209 or 309.

L BOT 310 Morphology and Evolution of Seed Plants
★3 *(fi 6)* (first term, 3-0-3). The seed was one of the major innovations in land plant evolution. Since their origin in the Devonian Period, seed plants have become the dominant group on land. This course examines the origins, early evolution and subsequent diversity of seed plant groups with an emphasis on morphology. Only a small fraction of the diversity of seed plants remains today. This course frames the diversity of living seed plant groups (Cycads, Ginkgos, Gnetophytes, Conifers and Angiosperms) in terms of a much greater fossil record. Prerequisite: BOT 210 or consent of Instructor. BOT 205 recommended. Offered in odd-numbered years.

BOT 314 Biology of Bryophytes
★3 *(fi 6)* (first term, 3-0-3). Hornworts, liverworts and mosses (bryophtes) are basal groups of land plants that are pivotal in the evolution, adaptation, and diversification of life in terrestrial environments. In addition, their diminutive size, relative structural simplicity and a dominant haploid generation have made bryophytes useful as model organisms for studies of plant function, development, and molecular biology. Lectures and labs will explore the biological diversity and provide a phylogenetic overview of these groups with an emphasis on species found in western Canadian environments. Prerequisite: BIOL 108 and a 200-level Biological Sciences course. BOT 205 and 210 recommended. May not be taken for credit if credit already obtained in BOT 305.

BOT 321 Flowering Plants
★3 *(fi 6)* (second term, 3-0-3). Modern approaches to the classification and evolution of the flowering plants. The diversity and relationships of the angiosperms are examined from a phylogenetic perspective. Topics include practical and theoretical aspects of species description, nomenclature and phylogeny interpretation, with a focus on the characteristics and significance of the major families of flowering plants in Alberta and from around the world. Prerequisite: BIOL 108. BOT 205 recommended. May not be taken for credit if credit already obtained in BOT 220 or 320.

O BOT 322 Field Botany
★3 *(fi 6)* (first term, 3-0-3). Lectures, laboratory, and field exercises provide an introduction to description and identification of plants and their local habitats. Factors affecting variation in natural vegetation and methods used to describe it are discussed. Field exercises and projects take place during the two weeks preceding the fall term and some may take place off campus. Presentations take place during the first four weeks of class time in September. Prerequisites: BIOL 108 and any 200-level Biology course. (BOT 321 is strongly recommended). May not be taken for credit if credit already obtained in BOT 304.

BOT 330 Biodiversity and Ecosystem Function of Algae
★3 *(fi 6)* (second term, 3-0-3). The remarkable biodiversity of algae provides the foundation for most aquatic ecosystems around the world. This course emphasizes the evolution, taxonomy, and ecology of major groups of algae to illustrate relationships between their form and function in pristine and polluted environments. Laboratories will focus on the taxonomic diversity of algae through the use of field surveys of local streams and lakes, and experiments using our extensive algal culture collection. Prerequisite: 200-level Biology course. Both BOT 205 and BIOL 208 recommended.

L BOT 332 Plant Ecology
★3 *(fi 6)* (first term, 3-0-3). Study of the local factors, which limit plant growth,

reproduction, and diversity. Particular emphasis on the mechanisms by which plants interact with their local environment and the effects of these interactions on diversity and community functioning. Specific topics include plant foraging, germination ecology, mechanisms of competition and facilitation, patterns of diversity, and community stability. Prerequisites: BIOL 208, STAT 151, and any university MATH course. BOT 205 recommended.

L BOT 350 Plant Biochemistry
★3 *(fi 6)* (first term, 3-0-0). Introduction to biochemistry of higher plants. Emphasis on plant-specific metabolic processes, and their regulation and molecular biology. Topics include structural and storage carbohydrates, lipid metabolism, nitrogen fixation and assimilation, photosynthetic processes, and secondary plant metabolites and their ecological functions. Prerequisites: BIOCH 200 or BIOCH 203 or 220. BOT 205 recommended. May not be for credit if credit already obtained in BOT 250.

L BOT 380 Drug Plants
★3 *(fi 6)* (second term, 3-0-0). Survey of historical and current use of important drug-producing plants. Evaluation of the chemistry and physiology of biologically active compounds from poisonous, analgesic, and hallucinogenic plants, and the current uses of such plant products. Use of plant biotechnology to develop drug-producing plants. Prerequisite: A 200-level Biological Sciences course. BOT 205 recommended.

L BOT 382 Plant Biotechnology
★3 *(fi 6)* (first term, 3-0-0). Using examples from current research, techniques used in modern plant biotechnology and the way this technology is being used to modify and improve economically important plants will be discussed. Specific topics will include; gene isolation, plant transformation, plant tissue culture, clonal plant propagation, and somatic embryogenesis. Prerequisite: BIOL 107 and a 200-level Biological Sciences course. BOT 205 recommended.

L BOT 384 Global Change and Ecosystems
★3 *(fi 6)* (second term, 3-0-0). Ecological impacts of climate change and large-scale human activities on terrestrial and aquatic ecosystems. The focus of this course is to learn to write brief technical summaries of current environment issues, in a fashion that can be understood by an educated citizen. Topics such as climate change, water management projects, invasion of exotic species and national parks management are presented as the forum to evaluate options, trade-offs and solutions to environmental social issues. Prerequisites: BIOL 208 or consent of Instructor. BOT 205 recommended.

L BOT 403 Plant Molecular Development
★3 *(fi 6)* (first term, 3-0-0). Recent advances in plant cell and molecular biology are introduced through a study of plant development at the molecular level. The course examines how developmental processes can be used as model systems to study the nature and pattern of gene expression in higher plants. Current research on the developmental biology of angiosperm and conifer seeds will be discussed. Prerequisite: BOT 382 or GENET 364. BOT 303 recommended. Offered in odd-numbered years. Credit cannot be obtained for both INT D 455 and BOT 403.

L BOT 409 Advanced Plant Anatomy
★3 *(fi 6)* (second term, 3-0-0). Lecture/discussion course dealing with advanced topics in plant structure and development. Prerequisite: BOT 308. Offered in even numbered years.

L BOT 411 Paleobotany
★3 *(fi 6)* (first term, 3-0-3). The fossil record of plants as it relates to the evolutionary history of existing groups. Prerequisite: A 300-level Biological or Earth Sciences course. Offered in even-numbered years.

L BOT 431 Physiological Ecology
★3 *(fi 6)* (first term, 3-0-3). Application of ecophysiological theory and practice of the study of plant responses to increasing carbon dioxide levels and increased irradiance of ultraviolet-B light. Experimental work includes demonstrations and individual projects making use of the phytotron facility. Seminars involve the discussion of significant research papers in the discipline. Prerequisites: A 200-level course in Plant Physiology and a senior course in Ecology. Offered in odd-numbered years.

L BOT 445 Plant Molecular Physiology
★3 *(fi 6)* (second term, 3-0-0). Molecular and cellular biology of plants, with emphasis on signaling and regulation of gene expression mediating physiological responses of plant cells. Topics covered include molecular responses to light, nutrients, and environmental cues, action of plant growth regulators, and regulation of metabolism. Prerequisite: BOT 382 or GENET 364. BOT 240 recommended. Offered in even-numbered years.

Graduate Courses

Notes
(1) All 300- and 400-level courses in the Department of Biological Sciences may be taken for credit (except for BIOL 490, 498 and 499) by graduate students with approval of the student's supervisor or supervisory committee.
(2) The following courses may be taken as an option in graduate programs in the Department of Biological Sciences with approval of the student's supervisor or supervisory committee. BIOCH 510, 520, 530, 541, 550, 555, 560; CHEM 361, 363, 461; CELL 300, 301; IMIN 371, 372, 452; INT D 421; MA SC 400, 401, 402, 410, 412, 420, 425, 430, 437, 440, 445, 470, 480; MMI 405, 415, 520; NEURO 472; NU FS 363; PALEO 318, 319; PHARM 601.

BOT 506 Advanced Mycology
★3 *(fi 6)* (second term, 1-3s-0). Reports and discussion of major and current research in the biosystematics and ecology of the fungi. Evaluation of methods of investigation in these areas. Offered in odd-numbered years.

BOT 511 Advanced Paleobotany
★3 *(fi 6)* (second term, 3-0-3). Special problems in paleobotany involving laboratory techniques and readings of current literature and oral written presentation. Offered in odd-numbered years.

BOT 600 Seminar in Plant Biology
★1 *(fi 2)* (either term, 0-2s-0). Credit for this course may be obtained more than once.

221.29 Business, BUS

Department of Strategic Management and Organization
Faculty of Business

Note: Enrolment in all BUS courses is restricted to students registered in the Faculty of Business, or to students registered in specified programs that require Business courses to meet degree requirements and who have obtained prior approval of their Faculty.

Undergraduate Courses

BUS 201 Introduction to Canadian Business
★3 *(fi 6)* (first term, 2-0-1.5). Provides students with an introduction to the Faculty and the functional areas of business. Students improve computer, presentation, leadership and group skills. Areas covered include introductions to statistics and research and selected areas from accounting, finance, information systems, marketing, operations, strategic management and others. Open only to students in the Faculty of Business.

BUS 490 Business Competition Part I
★1.5 *(fi 3)* (either term, 0-1.5s-0). Preparation for Student Competition in Business. Prerequisite: consent of Instructor.

BUS 491 Business Competition Part II
★1.5 *(fi 3)* (either term, 0-1.5s-0). Completion of Student Competition in Business. Prerequisite: BUS 490 and consent of Instructor.

Graduate Courses

BUS 601 Business Practicum
★3 *(fi 6)* (two term, 3-0-0). Students are divided into groups and the groups are assigned a project in either a business or government organization. At the end of the course each group is required to write a report and to make a presentation derived from the project to the other groups in the course. Prerequisite: All required Year 1 MBA core courses.

BUS 615 Biotechnology Law
★2 *(fi 4)* (either term, 0-2s-0). An introduction to the major legal and related issues confronting the growth of the health technology industries. Students are exposed to (1) regulatory requirements for commercial production of and the protection afforded to the creation of medical devices, products and compounds, and (2) issues of experimentation and ethical aspects of research. Offered in conjunction with the Faculty of Law.

BUS 686 Selected Topics in Business
★3 *(fi 6)* (either term, 3-0-0). Topics in this course may vary from year to year and are chosen at the discretion of the Instructor.

BUS 701 Qualitative Methodology for Business Research
★3 *(fi 6)* (either term, 3-0-0). Examines qualitative research methods as they apply to business research. Includes: the terrain and history of qualitative research, exploring different approaches to qualitative research, designing qualitative research, strategies of inquiry, qualitative data analysis, writing up research, and professional and ethical issues. Prerequisite: Registration in Business PhD Program or written permission of instructor. Approval of the Business PhD Program Director is also required for non-PhD students.

BUS 855 International Study Tour
★1.5 *(fi 16)* (second term, 18 hours). A week-long intensive course. Understanding the challenges facing local companies in their environment, for example, Asia or Eastern Europe. An on-site visit to the location is included. Restricted to Executive MBA students only.

BUS 860 Special Topics
★3 *(fi 32)* (first term, 3-0-0). Topics will vary from year to year. Restricted to Executive MBA students only.

BUS 875 Special Topics
★3 *(fi 32)* (second term, 3-0-0). Topics will vary from year to year. Restricted to Executive MBA students only.

BUS 880 Business Project
★3 *(fi 32)* (first term, 3-0-0). Students are required to conduct an operations audit on a client company and prepare a business plan. The company selected could be the student's own organization or an unit within the organization. Restricted to Executive MBA students only.

BUS 885 Business Project
★3 *(fi 32)* (second term, 3-0-0). Students will complete a custom-designed project for a client company under faculty supervision. Restricted to Executive MBA students only.

BUS 900 Directed Research Project
★3 *(fi 6)* (variable, unassigned).

221.30 Business Economics, BUEC

Department of Marketing, Business Economics, and Law
Faculty of Business

Note: Enrolment in all BUS courses is restricted to students registered in the Faculty of Business, or to students registered in specified programs that require Business courses to meet degree requirements and who have obtained prior approval of their Faculty.

Undergraduate Courses

BUEC 311 Business Economics, Organizations and Management
★3 *(fi 6)* (either term, 3-0-0). Business organizations as systems of mutually reinforcing functional areas where decision making is driven by underlying economic forces. Application of economic theory to facilitate complex decision making within organizations: economic models of decision making are linked directly to functional areas of management. Topics include the organization of firms and industries; meeting customer needs; and decision making involving production, resource use, dealing with risk and uncertainty, scale and scope of operations, competitive advantage, and product pricing. Prerequisites: ECON 101, 102, and MATH 113 or equivalent. Students may receive credit for only one of BUEC 301, BUEC 311, MANEC 301 or ECON 383. Not open to students with previous credit in ECON 281.

BUEC 342 Introduction to International Business
★3 *(fi 6)* (either term, 3-0-0). Provides students with an introduction to the tools they will require to succeed in the increasingly international business world. Serves as a basis for other more advanced courses in International Business. Topics covered could include Country Differences, International Trade, Foreign Direct Investment, Regional Economic Integration, The Foreign Exchange Market and International Business Strategy and Operations. Students may not receive credit for both BUEC 444 and 342.

BUEC 442 The Global Business Environment
★3 *(fi 6)* (either term, 3-0-0). Examines the changing global business environment and how it impacts international business decision-making. Topics covered could include Trends in Globalization, International Business in Canada, Managing Multinational Corporations, Importing and Exporting, International Labor Markets and the Market for Skills, International Financial Markets, Financial Crises, and Corporate Governance in Different Countries. Prerequisite: BUEC 342 or consent of Instructor. Students may not receive credit for both BUEC 445 and 442.

BUEC 448 International Study Tours
★3 *(fi 6)* (either term, 3-0-0). Combines lectures at the University of Alberta with on-site study tours to a foreign country. The study tour component is normally for a two- to three-week period, during which students participate in company tours, lectures, and language and cultural study to develop an appreciation for different business cultures and contexts. Upon return, students are expected to complete a group project or case study relating to the business environment of the country under study. Normally offered in Spring/Summer only. Prerequisite: Open to students who have completed at least one other international business course in the Faculty of Business.

BUEC 463 Energy and the Environment: Industry Structure, Performance and Challenges
★3 *(fi 6)* (either term, 3-0-0). Uses the basic tools of business economics in order to gain a better understanding of energy markets and industries. Differences and similarities between specific industries (oil, gas, electricity, etc.) and between different industry segments (exploration, production, retail, etc.) are highlighted. New challenges faced by the industry, most notably environmental concerns, but also globalization and new forms of competition, are analysed with respect to the impacts that they have had and might have in the future on firms' strategies and on market performance. Prerequisite: BUEC 311.

BUEC 479 Government and Business in Canada
★3 *(fi 6)* (either term, 3-0-0). The role of business in the public policy process: how business organizations influence public policy and its administration, and how public policies affect business. Processes of change are of particular interest. Attention is to the motivation, behavior patterns, and the dynamics of the interaction of different stakeholder groups, policy makers, and managers responsible for the implementation of public policies. Develops a framework for analysis of the effectiveness and efficiency of different fiscal, regulatory, and promotional policies; consideration is given to the impact of technological, economic, and social change on policy choice in the long term. Prerequisite: BUEC 311.

BUEC 488 Selected Topics in Business Economics
★3 *(fi 6)* (either term, 3-0-0). Normally restricted to third- and fourth-year Business students. Prerequisites: BUEC 311, ECON 281, or consent of Department. Additional prerequisites may be required.

BUEC 490 Business Economics Competition Part I
★1.5 *(fi 3)* (either term, 0-1.5s-0). Preparation for Student Competition in Business Economics. Prerequisite: consent of Instructor.

BUEC 491 Business Economics Competition Part II
★1.5 *(fi 3)* (either term, 0-1.5s-0). Completion of Student Competition in Business Economics. Prerequisite: BUEC 490 and consent of Instructor.

BUEC 495 Individual Research Project I
★3 *(fi 6)* (either term, 3-0-0). Special study for advanced undergraduates. Prerequisites: consent of Instructor and Assistant Dean, Undergraduate Program.

BUEC 496 Individual Research Project II
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. Prerequisites: BUEC 495, consent of the Instructor and Assistant Dean, Undergraduate Program.

BUEC 497 Individual Research Project III
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. Prerequisites: BUEC 496, consent of the Instructor and Assistant Dean, Undergraduate Program.

Graduate Courses

BUEC 502 Managerial Microeconomics
★3 *(fi 6)* (either term, 3-0-0). Focuses on economic decision making at the level of the firm and consumer, utilizing demand and supply analysis to help understand a variety of economic and managerial issues. Formal models of managerial economic problems will be developed and used for purposes of analysis. Also deals with public economics, regulatory economics and introduces issues of information economics and strategic behavior. The theory of public choice and public goods will be used to analyze a variety of public economic issues. Credit will not be given for both BUEC 501 and 502.

BUEC 512 Macroeconomics for Managers
★1.5 *(fi 3)* (either term, 18 hours). Measuring macroeconomic variables, sources of economic growth, business cycles, interest rates, exchange rates, government debt, and other topics. Offered in a six-week period. Prerequisite: BUEC 501 or 502.

BUEC 541 Introduction to International Business
★1.5 *(fi 3)* (either term, 18 hours). Provides students with an introduction to the tools they will require to succeed in the increasingly international business world. Serves as a basis for other more advanced courses in International Business, covering such topics as Country Differences, International Trade, Foreign Direct Investment, Regional Economic Integration, The Foreign Exchange Market and International Business Strategy and Operations. Prerequisites: BUEC 501 or 502, and 512.

BUEC 560 Energy Technology and Institutions
★1.5 *(fi 3)* (either term, 18 hours). An introduction to the physical and institutional realities of the energy sector. Topics include production, distribution, and marketing issues related to oil and gas and electricity. Canadian public policy processes and regulatory issues relating to the energy sector are also addressed. Offered in a six-week period. Prerequisite: BUEC 502 or 511.

BUEC 562 Environmental Economics
★1.5 *(fi 3)* (either term, 18 hours). The economic theory of externalities and how alternative policy instruments such as taxes, tradable permits and regulatory standards are used to deal with externalities. Topics include current environmental issues such as competing in land uses, toxic emissions, water pollutions, Sulphur Dioxide and climate change. Environmental policies and policy debates are also discussed. Offered in a six-week period. Prerequisite: BUEC 502 or 511.

BUEC 586 Selected Topics in Business Economics
★1.5 *(fi 3)* (either term, 3-0-0). Topics in this seminar may vary from year to year and are chosen at the discretion of the Instructor.

BUEC 646 The Global Business Environment
★3 *(fi 6)* (either term, 3-0-0). Examines the changing global business environment and how it impacts international business decision-making. Covers such topics as Trends in Globalization, International Business in Canada, Managing Multinational

Corporations, Importing and Exporting, International Labor Markets and the Market for Skills, International Financial Markets, Financial Crises, and Corporate Governance in Different Countries. Prerequisite: BUEC 541 or consent of Instructor.

BUEC 654 Asian Economies, Business and Management
★3 *(fi 6)* (either term, 3-0-0). Examines the key institutional arrangements that characterize the Asian economies, business arrangements and management practices. The role of financial arrangements, labour markets, trade patterns and industrial policy in the development of the Asian economies will be analyzed. Implications for doing business in the region will be studied. Prerequisite: BUEC 512.

BUEC 663 Natural Resources and Energy Capstone
★3 *(fi 6)* (either term, 3-0-0). A project-focused course dealing with market, business and policy issues and challenges in the natural resources and energy sectors. The specific content and issues addressed can change from year to year as a function of the evolution of markets and business activities. Involves some lectures supplemented by visiting speakers. The core course activity is a group project focused on a specific industry or business challenge. Prerequisites: BUEC 502 or 511, and 560 and 562.

BUEC 670 International Film, Television and New Media Business
★3 *(fi 6)* (either term, 3-0-0). This course looks at how the international feature film, television and new media business works. The basic for US competitive advantage and dominance is analyzed. Corporate competitive strategy and public policy responses to this dominance are examined.

BUEC 678 Managing Business-Government Relations in Canada
★3 *(fi 6)* (either term, 3-0-0). The role of business in the public policy process: How business organizations influence public policy and its administration, and how public policies affect business. Processes of change are of particular interest. Attention is placed on the motivation, behavior patterns, and the dynamics of the interaction of different stakeholder groups, policy makers, and managers responsible for the implementation of public policies. Develops a framework for analysis of the effectiveness and efficiency of different fiscal, regulatory, and promotional policies; consideration is given to the impact of technological, economic, and social change on policy choice in the long run. Prerequisites: BUEC 501 and 511 (or 502), and 512.

BUEC 686 Selected Topics in Business Economics
★3 *(fi 6)* (either term, 3-0-0). Topics in this seminar may vary from year to year and are chosen at the discretion of the Instructor.

BUEC 820 Business Economics
★3 *(fi 32)* (first term, 3-0-0). Outlining the main schools of economic theory, macroeconomic tools and the effects of macroeconomic policy on business performance; reviewing decision-making processes of individual firms, as well as consumer behavior, price theory, marginal analysis, and forms of competition. Restricted to Executive MBA students only.

BUEC 850 Business/Government Interface
★1.5 *(fi 16)* (first term, 18 hours). A week-long intensive course. Understanding trends affecting business decision making; the regulatory environment; business/government interfaces; and the management of public affairs. Restricted to Executive MBA students only.

BUEC 860 International Business
★3 *(fi 32)* (first term, 3-0-0). Understanding the globalization of business, international trade and trading blocks; planning for market entry and development; exporting, joint ventures, direct investment; developing the skills of an international manager. Restricted to Executive MBA students only.

221.31 Business Law, B LAW

Department of Marketing, Business Economics, and Law
Faculty of Business

Note: Enrolment in all B LAW courses, except B LAW 301, is restricted to students registered in the Faculty of Business, or to students registered in specified programs that require Business courses to meet degree requirements and who have obtained prior approval of their Faculty.

Undergraduate Courses

B LAW 301 Legal Foundations of the Canadian Economy
★3 *(fi 6)* (either term, 3-0-0). Synoptic view of Canadian legal system, with emphasis on underlying considerations of social policy. While considering the nature, sources, philosophy, and policy objectives of the law, selected topics from the fields of tort and contract will be analyzed. Credit will be granted for only one of B LAW 301 and ENGG 420.

B LAW 402 Business Contracts
★3 *(fi 6)* (either term, 3-0-0). Examination of the special types of contracts that are encountered in business and commercial life. Topics include contract of sale, agency, negotiable instruments, insurance, bailment, employment contracts and contracts involving land as well as societal regulation of the freedom of contract. Prerequisite: B LAW 301 or ENGG 420.

B LAW 403 Commercial Transactions
★3 *(fi 6)* (either term, 3-0-0). Integrated analysis of the legal principles applying to commercial transactions, including an examination of the statutes and case law governing the sale of goods, conditional sale and chattel mortgages. Prerequisite: B LAW 301 or ENGG 420.

B LAW 422 Law of Business Organizations
★3 *(fi 6)* (either term, 3-0-0). Introduction to the role of the corporation in the business and commercial life of Canada and Alberta, with emphasis on the small private company. Topics include characteristics of corporate existence, process of incorporation, forming a private company, relationship with third parties, distinction between management and ownership, duties of directors and officers, and shareholder rights. Prerequisite: B LAW 301 or ENGG 420.

B LAW 428 Natural Resource and Environmental Law
★3 *(fi 6)* (either term, 3-0-0). The legal framework in which managerial decisions affecting the environment are taken. Substance of environmental law and the procedures for enforcing it. Interaction of this legal approach with business strategies for dealing with environmental issues is analyzed. Prerequisite: B LAW 301 or ENGG 420.

B LAW 432 The Legal Regulation of Business
★3 *(fi 6)* (either term, 3-0-0). An examination of the principles of law that underlie the administrative regulation of business by governmental agencies. A representative agency from each of the three levels of government will be analysed to determine how it is created, what powers it possesses, how it uses its powers and how its powers are constrained. Prerequisite: B LAW 301 or ENGG 420.

B LAW 442 International Business Law
★3 *(fi 6)* (either term, 3-0-0). Study of the law regulating the conduct of international business transactions. This includes trade law (GATT, commodity agreements, economic integration, national rules); finance law (IMF, OECD, ICSID, multinationals, promotion and financing of world trade); and commercial law (payment mechanisms, international commercial contracts, UN Convention on the International Sale of Goods, settlement procedures, pertinent national and international laws). Prerequisite: Open to third-year and fourth-year students.

B LAW 444 International Business Transactions
★3 *(fi 6)* (either term, 3-0-0). An overview of current international business patterns and the laws surrounding such patterns, with an emphasis on what makes them different from domestic ones. A major force underlying the internationalization of the world economy has been the rapid, sustained growth of international business, both in the traditional form of international trade and in the newer forms of multinational, global and transnational business. This course is designed to provide the student with a basic understanding of the major rules governing cross-border commercial transaction in the contexts of both substantive and procedural law.

B LAW 488 Selected Topics in Business Law
★3 *(fi 6)* (either term, 3-0-0). Normally restricted to third- and fourth-year Business students. Prerequisites: B LAW 301 or consent of department. Additional prerequisites may be required.

B LAW 490 Business Law Competition Part I
★1.5 *(fi 3)* (either term, 0-1.5s-0). Preparation for Student Competition in Business Law. Prerequisite: consent of Instructor.

B LAW 491 Business Law Competition Part II
★1.5 *(fi 3)* (either term, 0-1.5s-0). Completion of Student Competition in Business Law. Prerequisite: B LAW 490 and consent of Instructor.

B LAW 495 Individual Research Project I
★3 *(fi 6)* (either term, 3-0-0). Special study for advanced undergraduates. Prerequisites: consent of Instructor and Assistant Dean, Undergraduate Program.

B LAW 496 Individual Research Project II
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. Prerequisites: B LAW 495, consent of the Instructor and Assistant Dean, Undergraduate Program.

B LAW 497 Individual Research Project III
★3 *(fi 6)* (either term, 3-0-0). Special Study for advanced undergraduates. Prerequisites: B LAW 496, consent of the Instructor and Assistant Dean, Undergraduate Program.

Graduate Courses

B LAW 628 Natural Resource and Environmental Law
★3 *(fi 6)* (either term, 3-0-0). The course considers the legal framework in which managerial decisions affecting the environment are taken. It looks at the substances of environmental law and the procedures for enforcing it. The interaction of this legal approach with business strategies for dealing with environmental issues is analyzed.

B LAW 642 International Business Law
★3 *(fi 6)* (either term, 3-0-0). Deals with the international law that provides the regulatory and transactional context in which international commerce takes place. A major force underlying the internationalization of the world economy has been the rapid, sustained growth of international business, both in the traditional form of international trade and in the newer forms of multinational, global and transnational business. Provides an overview of the international economic order, including the law of the World Trade Organization, and examines the rules with respect to contractual obligations, tariffs, quantitative restrictions, subsidies, discrimination, dispute settlement, government procurement and other matters that concern international trade in both goods and services. The international regulation of direct investment, financial flows and multinationals may also be addressed.

B LAW 686 Selected Topics in Business Law
★3 *(fi 6)* (either term, 3-0-0). Topics may vary from year to year and are chosen at the discretion of the instructor.

221.32 Canadien-français, CA FR

Faculté Saint-Jean

Cours de 1er cycle

O CA FR 320 Les francophonies canadiennes et acadiennes I: perspectives historiques et culturelles
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Les fondements et l'évolution des communautés francophones et acadiennes du Canada, du Régime français à aujourd'hui, par l'étude de textes littéraires, historiographiques et ethnologiques. Un aperçu de leurs traditions orales, de leurs pratiques culturelles et des rapports avec les cultures avoisinantes: Autochtones, Loyalistes, Irlandais, etc. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour ETCAN 322.

O CA FR 322 Les francophonies canadiennes et acadiennes II: perspectives idéologiques et politiques
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). La civilisation et la culture du Canada français et de l'Acadie, du Régime français à nos jours, par l'étude des idéologies politiques et des procédés juridiques régissant leur développement et leurs modes de communication collective. Le statut ambivalent de majoritaire/minoritaire vu à travers le prisme du post-colonialisme et du multiculturalisme. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour ETCAN 322.

O CA FR 350 Panorama de la littérature canadienne-française
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Littérature canadienne-française, des origines à nos jours, vue à travers un choix d'oeuvres dominantes marquant les diverses périodes de son évolution. Préalable(s): FRANC 235.

O CA FR 465 La poésie canadienne-française du XXe siècle
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). L'évolution de la poésie canadienne-française de Saint-Denys Garneau à l'époque contemporaine. Préalable(s): FRANC 235 et ★3 en littérature de niveau 300, préférablement CA FR 350.

O CA FR 470 Le roman canadien-français du XXe siècle
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Le roman canadien-français depuis la génération de 1890 jusqu'à la naissance du nouveau roman, vu à travers les plus grands romanciers de cette période. Préalable(s): FRANC 235 et ★3 en littérature de niveau 300, préférablement CA FR 350.

O CA FR 480 Choix de sujet
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Préalable(s): FRANC 225, 235 et ★3 en littérature de niveau 300.

O CA FR 485 Ecriture au féminin dans la littérature québécoise ou canadienne d'expression française
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). L'étude de textes critiques et littéraires dans le but de cerner le concept d'écriture au féminin. Préalable(s): FRANC 235 et ★3 en littérature de niveau 300. Recommandé: CA FR 350.

221.33 Cell Biology, CELL

Departments of Biological Sciences and Cell Biology
Faculties of Science and Medicine and Dentistry

Undergraduate Courses

O CELL 201 Introduction to Molecular Cell Biology
★3 *(fi 6)* (second term, 3-0-0). An introductory Cell Biology course suitable for students interested in pursuing Cell Biology specialization/honors. This course focuses on the molecular aspects of modern cell biology. Topics covered include the nucleus and gene expression; membrane structure and function; signal transduction; organelle biogenesis; cytoskeleton and cell motility; cell adhesion; the cell cycle, cancer; differentiation and stem cell technology. Reference will be made to key investigations and new technologies that have defined modern cell biology. Prerequisite: BIOL 107. Pre - or corequisite: CHEM 161 or 261. Note: Not to be taken by students with credit in BIOL 201, in addition, not available to students currently enrolled in BIOL 201.

O CELL 300 Advanced Cell Biology I
★3 *(fi 6)* (first term, 3-0-0). Senior course studying various topics in modern molecular cell biology emphasizing the design of experiments, the interpretation of their results and the extrapolation of their findings. Examines aspects of eukaryotic cell structure and function. Includes, but not restricted to, areas such as intracellular signaling, protein targeting and organelle biogenesis, and cell-cell interactions. Makes extensive use of current literature to illustrate important concepts. Prerequisites: BIOL 201 or CELL 201 and BIOCH 200.

O CELL 301 Advanced Cell Biology II
★3 *(fi 6)* (second term, 3-0-0). Continuation of CELL 300, covering topics from CELL 300 in greater depth and recent developments in cell biology. Intended for, but not restricted to, students in the Cell Biology Honors and Specialization programs.

CELL 402 The Birth and Death of a Cell
★3 *(fi 6)* (second term, 3-0-0). An advanced course dealing with cell differentiation, intracellular and extracellular signaling processes, the cell cycle and apoptosis. Consists of lecture material and small group learning sessions and requires reading and discussion of current research articles. Prerequisites: CELL 300 and/or 301 or consent of Department. Enrolment is limited and registration is by permission of the Department.

CELL 415 Developmental and Molecular Neurobiology
★3 *(fi 6)* (first term, 0-2s-0). This course explores topics in developmental neurobiology, including cell lineage, nerve growth and guidance, myelination, synapse formation, axonal transport, and response to injury. In particular, the course emphasizes theoretical and experimental aspects, the expanding roles of molecular biology in studies in this field, and areas of present and future research. Prerequisite: consent of Department. Note: Offered in odd-numbered years.

CELL 445 Current Topics in Cell Biology
★3 *(fi 6)* (first term, 3-0-0). Appraisal of current literature dealing with recent advances in selected topics in cellular and molecular biology. Intended for fourth-year students in the Cell Biology program. Information is provided in the form of selected readings of current papers, guest lecturers, and through student seminar presentations. Introduces students to current research topics in cellular and molecular biology, and enhances their appraisal and presentation of scientific material. Prerequisites: CELL 300, CELL 301 or permission of Instructor.

CELL 495 Individual Study
★3 *(fi 6)* (either term, 0-0-6). Registration contingent on the student's having made prior arrangements with a Faculty member in a department participating in the Cell Biology Program. Credit may be obtained for this course more than once. Prerequisites: A 300-level CELL, Biological Sciences, or Biochemistry course, and the consent of the Cell Biology Undergraduate Advisor.

CELL 498 Research Project
★3 *(fi 6)* (either term, 0-0-6). Directed research carried out in the laboratory of an assigned member of a department participating in the Cell Biology Program. Credit may be obtained for this course more than once. Successful completion requires a written report. Prerequisite: A 300-level CELL, Biological Sciences, or Biochemistry course and the consent of the Cell Biology Undergraduate Advisor.

CELL 499 Research Project
★6 *(fi 12)* (two term, 0-0-6). Directed research carried out in the laboratory of an assigned member of a department participating in the Cell Biology Program. The project normally continues through Fall and Winter Terms. Successful completion of this course requires a written report and oral presentation on the research project. Prerequisite: A 300-level CELL, Biological Sciences, or Biochemistry course and consent of the Cell Biology Undergraduate Advisor.

Graduate Courses

CELL 502 The Birth and Death of a Cell
★3 *(fi 6)* (second term, 3-0-0). An advanced course dealing with cell differentiation, intracellular and extracellular signaling processes, the cell cycle and apoptosis. Consists of lecture material and small group learning sessions and will require reading and discussion of current research articles. Lectures are the same as for CELL 402 but with additional assignments and evaluation appropriate to graduate studies. May not be taken if credit has already been obtained in CELL 402. Prerequisites: Consent of the Department.

CELL 515 Developmental and Molecular Neurobiology
★3 *(fi 6)* (first term, 0-2s-0). This course explores nine topics in developmental neurobiology, including cell lineage, nerve growth and guidance, myelination, synapse formation, axonal transport, and response to injury. In particular, the course will emphasize theoretical and experimental aspects, the expanding roles

of molecular biology in studies in this field, and areas of present and future research. Lectures are the same as for CELL 415 but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken if credit has already been obtained in CELL 415. Prerequisite: consent of Department. Note: Offered in odd-numbered years.

CELL 545 Current Topics in Cell Biology
★3 *(fi 6)* (first term, 3-0-0). Appraisal of current literature dealing with recent advances in selected topics in cellular and molecular biology. Intended for graduate students in the MSc program. Information is provided in the form of selected readings or current papers, guest lecturers and through student presentations. Introduces students to current research topics in cellular and molecular biology and enhances their appraisal and presentation of scientific material. Lectures are the same as for CELL 445 but with additional assignments and evaluation appropriate to graduate studies. This course may not be taken for credit if credit has already been obtained in CELL 445. Prerequisite: consent of Instructor.

CELL 614 Molecular Mechanisms of Cellular Regulation
★3 *(fi 6)* (first term, 0-4s-0). Current appraisal of scientific literature in selected areas of molecular and cellular biology. Information is provided in the form of selected readings of current papers, and through student seminar presentations. The overall goal is to introduce students to current research topics in molecular and cellular biology, and to enhance their abilities in the appraisal and presentation of scientific material. Enrolment is limited to twelve students, early registration is recommended. Permission to register is required from the instructor.

CELL 671 Recent Advances in Cell Biology
★2 *(fi 4)* (two term, 0-1s-0). A seminar course on topics of current interest in Cell Biology. Students will attend seminars and contribute a journal club presentation based on recent developments published in first rate journals. Note: Open only to Graduate students in Cell Biology.

CELL 672 Recent Advances in Cell Biology
★2 *(fi 4)* (two term, 0-1s-0). A seminar course on topics of current interest in Cell Biology. Students will attend seminars and contribute a presentation on their research project that includes original data. Prerequisite: CELL 671 or consent of the Department. Note: Open only to Graduate students in Cell Biology.

221.34 Chemical and Materials Engineering, CME

Department of Chemical and Materials Engineering
Faculty of Engineering

Undergraduate Courses

CME 200 Introduction to Chemical and Materials Engineering
★1 *(fi 2)* (first term, 1 day). Topics of interest to second year Chemical and Materials Engineering students, with special reference to industries in Alberta. Offered in a single day during the first week of September. Restricted to students registered in the Department of Chemical and Materials Engineering.

CME 265 Process Analysis
★4.5 *(fi 6)* (either term or Spring/Summer, 3-0-3). Basic process principles; material and energy balances, transient processes, introduction to computer-aided balance calculations; one tour to a local chemical plant. Prerequisites: ENCMP 100, MATH 102 and CHEM 105. Corequisites: CH E 243 and MATH 209 or equivalent. Credit may not be obtained in this course if previous credit has been obtained for CH E 265.

CME 481 Colloquium I
★1 *(fi 2)* (either term or Spring/Summer, 1-0-0). Oral presentations. Graded on a pass/fail basis. Prerequisite: 85 units completed or consent of Instructor. Credit may not be obtained in this course if previous credit has been obtained for CH E 481.

CME 483 Colloquium II
★1 *(fi 2)* (second term, 1-0-0). Oral presentation of technical material. Graded on a pass/fail basis. Prerequisite: CME 481. Credit may not be obtained in this course if previous credit has been obtained for CH E 483.

Graduate Courses

CME 681 Graduate Seminar I
★1 *(fi 2)* (either term, 0-2s-0). Discussion of progress and problems in research in Chemical and Materials Engineering.

CME 682 Graduate Seminar II
★1 *(fi 2)* (either term, 0-2s-0). Discussion of progress and problems in research in Chemical and Materials Engineering.

CME 683 Graduate Seminar III
★1 *(fi 2)* (either term, 0-2s-0). Discussion of progress and problems in research in Chemical and Materials Engineering.

CME 684 Graduate Seminar IV
★1 *(fi 2)* (either term, 0-2s-0). Discussion of progress and problems in research in Chemical and Materials Engineering.

221.35 Chemical Engineering, CH E

Department of Chemical and Materials Engineering
Faculty of Engineering

The following courses were renumbered effective 2001/2002

Old	New	Old	New
CHE 316	CH E 416	CH E 434	CH E 345
CH E 365	CH E 464	CH E 436	CH E 583
CH E 390	CH E 484	CH E 502	CH E 482
CH E 418	CH E 318		

The following courses were renumbered effective 2005/06

Old	New	Old	New
CH E 200	CME 200	CH E 683	CME 681
CH E 265	CME 265	CH E 684	CME 682
CH E 481	CME 481	CH E 685	CME 683
CH E 483	CME 483	CH E 686	CME 684

Undergraduate Courses

Note: The Chemical Engineering Department offers a regular academic term from May-August. Courses designated as "Spring/Summer" in this section of the Calendar are part of this academic term and normally run for the full May-August period.

CH E 243 Engineering Thermodynamics
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). An introduction to the first and second laws of thermodynamics. Prerequisites: MATH 101, and EN PH 131.

CH E 265 Process Analysis
★4.5 *(fi 6)* (either term or Spring/Summer, 3-0-3). Basic process principles; material and energy balances, transient processes, introduction to computer-aided balance calculations; one tour to a local chemical plant. Prerequisites: ENCMP 100, MATH 102 and CHEM 105. Corequisites: CH E 243 and MATH 209 or equivalent.

CH E 312 Fluid Mechanics
★3.5 *(fi 6)* (either term, 3-1s-0). Newtonian and non-Newtonian fluid behavior; hydrostatics; buoyancy, application of Bernoulli and momentum equations; frictional losses through pipes, ducts, and fittings; pipe networks; pumps; drag on submerged bodies and flow through porous media. Prerequisites: CH E 243 and MATH 209. Corequisite: MATH 201.

CH E 314 Heat Transfer
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). Principles of conduction, convection and radiation heat transfer. Design and performance analysis of thermal systems based on these principles. Prerequisites: MATH 201, CH E 312 and 374.

CH E 318 Mass Transfer
★4 *(fi 6)* (either term or Spring/Summer, 3-0-2). Molecular and turbulent diffusion; mass transfer coefficients; mass transfer equipment design including absorption and cooling towers, adsorption and ion exchange. Prerequisites: CME 265, CH E 312 and 343. Corequisite: CH E 314. Credit may not be obtained in this course if previous credit has been obtained for CH E 418.

CH E 343 Chemical Engineering Thermodynamics
★3.5 *(fi 6)* (either term, 3-1s-0). Thermodynamics of non-ideal gases and liquids; vapour-liquid equilibrium, thermodynamics of chemical processes and multicomponent systems. Prerequisite: CH E 243. Corequisite: CME 265.

CH E 345 Chemical Reactor Analysis I
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). Kinetics of chemical reactions and design of ideal chemical reactors. Prerequisites: CME 265, CH E 343 and 374. Credit may not be obtained in this course if previous credit has been obtained for CH E 434.

CH E 351 Chemical Engineering Laboratory
★3.5 *(fi 6)* (either term, 2-0-3). Technical report writing; thermodynamics, material, and energy balances, and calibration experiments. Prerequisites: ENGL 199 or equivalent, CME 265 and CH E 243. Corequisite: CH E 312.

CH E 358 Process Data Analysis
★5 *(fi 6)* (either term or Spring/Summer, 3-0-4). Statistical analysis of process data from chemical process plants and course laboratory experiments. Topics covered include least squares regression, analysis of variance, propagation of error, and design of experiments. Prerequisites: CH E 351 and STAT 235. Corequisites: CH E 314 and 345.

CH E 374 Computational Methods in Engineering
★3.5 *(fi 6)* (either term, 3-1s-0). Formulation and solution of chemical and materials engineering problems; solution of systems of linear and nonlinear algebraic equations; numerical interpolation, differentiation and integration; numerical solution of ordinary and partial differential equations. Prerequisites: ENCMP 100 (or equivalent). MATH 102, 201 and 209. Credit cannot be obtained in this course if credit has already been obtained CH E 474 or MATE 390.

CH E 416 Equilibrium Stage Processes
★4 *(fi 6)* (either term or Spring/Summer, 3-0-2). Design of separation processes with emphasis on the equilibrium stage concept, distillation, absorption and extraction. Prerequisites: CH E 343, 314 and 318. Credit may not be obtained in this course if previous credit has been obtained for CH E 316.

CH E 434 Chemical Reactor Analysis
★3.5 *(fi 6)* (second term or Spring/Summer, 3-1s-0). Kinetics of chemical reactions; design of chemical reactors. Prerequisite: CH E 343.

CH E 435 Oilsands Engineering Design
★6 *(fi 6)* (second term, 4-0-4). Integration of chemical engineering practice, theory and economics into the design and evaluation of proposed capital projects in the oilsands industry. Prerequisites: CHE 416, 445 and 464. Registration restricted to students in the Oilsands Engineering Option.

CH E 445 Chemical Reactor Analysis II
★3.5 *(fi 6)* (either term, 3-1s-0). Analysis and design of non-ideal chemical reactors for industrial product synthesis. Prerequisites: CH E 314, 318 and 345.

CH E 446 Process Dynamics and Control
★4 *(fi 6)* (either term or Spring/Summer, 3-1s-3/3). Introduction to process modeling and transient response analysis; design and analysis of feedback systems; stability analysis; process control applications; process control using digital computers. Prerequisites: MATH 201 and 209. Corequisite: CH E 312.

CH E 448 Process Control for Mechanical Engineers
★4 *(fi 6)* (second term, 3-1s-3/3). Introduction to systems modeling and transient response analysis with an emphasis on mechanical engineering applications; design and analysis of feedback systems; stability analysis; feedforward control; process control applications. Prerequisites: MATH 201 or equivalent, MATH 209, and MEC E 330. Corequisite: MEC E 370. Restricted to students registered in the Mechanical Engineering program. Credit may not be obtained in this course if previous credit has been obtained for CH E 446.

CH E 453 Chemical Engineering Laboratory II
★3 *(fi 6)* (first term or Spring/Summer, 1-0-4). Experiments in fluid mechanics and heat transfer. Prerequisites: CH E 312, 314 and 351.

CH E 454 Chemical Engineering Project Laboratory
★3 *(fi 6)* (second term, 1-0-4). Experiments in kinetics and mass transfer. Prerequisites: CH E 318, 345, 358, and 416.

CH E 458 Special Projects in Chemical Engineering
★3.5 *(fi 6)* (either term or Spring/Summer, 2-0-3). Projects in Chemical Engineering. This course is open only to students with a GPA of 3.0 or greater during the previous two academic terms. Prerequisite: consent of Department.

CH E 459 Special Projects in Chemical Engineering II
★3.5 *(fi 6)* (either term, 2-0-3). Projects in Chemical Engineering. This course is open only to students with a GPA of 3.0 or greater during the previous two academic terms. Prerequisite: CH E 458.

CH E 464 Chemical Engineering Design I
★4.5 *(fi 6)* (either term or Spring/Summer, 3-0-3). Engineering design concepts; cost estimation; project planning and scheduling; plant safety and hazards analysis; selected project design examples. Prerequisites: CH E 314, 345, and ENGG 310 or 401. Corequisite: CH E 416. Credit may not be obtained in this course if previous credit has been obtained for CH E 365.

CH E 465 Chemical Engineering Project Laboratory
★6 *(fi 6)* (second term, 4-0-4). Integration of chemical engineering practice, theory and economics into the design and evaluation of proposed capital projects. Prerequisites: CH E 345, 416 and 464.

CH E 481 Colloquium I
★1 *(fi 2)* (either term or Spring/Summer, 1-0-0). Oral presentations. Graded on a pass/fail basis. Prerequisite: 85 units completed or consent of Instructor.

CH E 482 Environmental Impact of the Process Industries
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). Industrial emissions, pollution control, and waste minimization. Special processes, design techniques and operating procedures related to environmental and ecological considerations. Corequisite: CH E 416. Credit may not be obtained in this course if previous credit has been obtained for CH E 502.

CH E 484 Introduction to Biochemical Engineering
★3.5 *(fi 6)* (either term, 3-0-1). Physical and chemical properties of cells, tissues, and biological fluids; engineering analysis of processes such as cell growth and fermentation; purification of products. Prerequisite: CH E 265 or BIOL 107. Credit may not be obtained in this course if previous credit has been obtained for CH E 390.

CH E 485 Fuel Cells and Their Application
★3 *(fi 6)* (either term, 3-0-0). Introduction to principles of operation of fuel cells and their applications: historical and environmental perspectives; elementary electrochemistry; types of fuel cell - fuels, membranes and liquid ion conductors, operating conditions; factors affecting performance; applications as standing engines and mobile power sources. Limited to 3rd/4th year undergraduate students in engineering. Prerequisite: CH E 243, MATE 252 or equivalent and MATH 201 or consent of instructor.

CH E 486 Microbial Processes in Engineering
★3 *(fi 6)* (either term, 3-1s-0). Review of fundamental bioprocesses including global nutrient cycling. Application of bioprocess knowledge to problem resolution under various thermodynamic conditions in areas such as water and pasture management and production of foods and drugs.

CH E 512 Introduction to Fluid-Particle Systems
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). Unit operations studied in this course include: settlers, thickeners, centrifuges, slurry pipelines and flotation columns. Course topics will also include: one dimensional homogeneous and multiphase flows, sedimentation and fluidization of multi-species systems and drift flux theory. Prerequisite: CH E 312.

CH E 520 Mixing in the Process Industries
★4 *(fi 6)* (either term, 3-1s-1). Design and operation of agitation equipment in the process industries. Process results ranging from blending, solids suspension, and gas dispersion to reactor design and heat transfer will be examined. Emphasis on critical application of the fundamentals of chemical engineering. Laminar and turbulent regimes, stirred tanks and static mixers, and other specialized applications will be discussed. Prerequisites: CH E 265 and 312. Credit cannot be obtained in this course if credit has already been obtained in CH E 620.

CH E 522 Hydrocarbon Fluid Properties and Processing
★4 *(fi 6)* (either term or Spring/Summer, 3-1s-3/3). Introduction to the physical, chemical and engineering principles required for the design and operation of plants used for the treatment of natural gas, heavy oils and bitumens. Prerequisite or corequisite: CH E 343.

CH E 534 Fundamentals of Oilsands Extraction
★4 *(fi 6)* (either term, 3-1s-3/3). Application of fluid mechanics, interfacial phenomena and colloid science to bitumen extraction. Prerequisites: CH E 312 and 314.

CH E 537 Environmental Aspects of Oilsands Processing
★4 *(fi 6)* (either term, 3-1s-3/3). Energy consumption, atmospheric emissions and treatment of liquid and solid wastes in extraction and upgrading of oilsands. Corequisite: CH E 416.

CH E 555 Process Optimization
★3.5 *(fi 6)* (either term, 3-1s-0). Single and multivariable search techniques; linear programming; dynamic programming; EVOP; nonlinear programming. Prerequisites: CH E 374 and MATH 201 or consent of Instructor.

CH E 572 Modelling Process Dynamics
★4 *(fi 6)* (second term, 3-1s-3/3). Mechanistic and empirical modeling of process dynamics; continuous- and discrete-time models; model fitting and regression analysis. Corequisites: CH E 314, 318 and 345.

CH E 573 Digital Signal Processing for Chemical Engineers
★3.8 *(fi 6)* (second term, 3-0-3/2). Time and frequency domain representation of signals; Fourier Transform; spectral analysis of data; analysis of multivariate data; treatment of outliers and missing values in industrial data; filter design. Prerequisites: CH E 358 and 446.

CH E 576 Intermediate Process Control
★3.8 *(fi 6)* (second term, 3-0-3/2). Digital and multivariable process control techniques; discrete-time analysis of dynamic systems; digital feedback control; Kalman filter and linear quadratic optimal control; model predictive control. Prerequisite: CH E 446 or equivalent.

CH E 580 Pulp and Paper Technology for Chemical Engineers
★3.5 *(fi 6)* (either term, 3-1s-0). Describes the resources, processes and chemistry, design and flow sheets, environmental impact, and remediation of pulp and paper manufacture with special reference to Alberta. Prerequisite: CH E 314 or consent of Instructor.

CH E 581 Biochemical Engineering
★3.5 *(fi 6)* (either term, 3-1s-0). Integration and application of the principles of chemical engineering, biochemistry, and microbiology. Topics include design, analysis and control of biological reactors and the development of production and recovery processes for biochemicals. Prerequisite: MICRB 265 or consent of Instructor.

CH E 582 Introduction to Biomaterials
★3.5 *(fi 6)* (either term, 3-1s-0). Survey of materials intended for biological applications; biomaterials-related biological phenomena (protein adsorption, blood coagulation and cell adhesion); biomaterials for engineering of blood vessel, bone and skin tissues. Two fundamental engineering philosophies will be stressed: structure-function relationship and purposeful manipulation for a desired outcome. Prerequisite: BIOL 107 or BME 210 or CH E 484 or consent of Instructor.

CH E 583 Surfaces and Colloids
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). Interactions between fluid phases and solids; micelles; electrokinetic phenomena; adsorption isotherms; applications to industrial processes. Prerequisite: CH E 343. Credit cannot be obtained in this course if previous credit has been obtained for CH E 436.

CH E 594 Advanced Topics in Chemical Engineering
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). An advanced treatment of selected chemical engineering topics of current interest to staff and students.

CH E 596 Advanced Topics in Process Dynamics and Control
★3.5 *(fi 6)* (either term or Spring/Summer, 3-1s-0). An advanced treatment of selected topics in process dynamics and control.

Graduate Courses

Note: All 500-level courses may be taken for graduate credit subject to the approval of the student's supervisory committee and departmental restrictions on the number of such courses that a student's program may contain.

CH E 611 Advanced Transport Phenomena
★3 *(fi 6)* (either term, 3-0-0). Transport expressions for physical properties are combined with conservation laws to yield generalized equations used to solve a variety of engineering problems in fluid mechanics, and heat and mass transfer; steady-state and transient cases; special topics in non-Newtonian flow and forced diffusion.

CH E 612 Advanced Fluid Mechanics
★3 *(fi 6)* (either term, 3-0-0). Potential, boundary layer, viscometrics, and secondary flows; application to multiphase phenomena.

CH E 615 Advanced Separation Processes
★3 *(fi 6)* (either term, 3-0-0). Characterization, selection and design of equilibrium and rate-governed separation processes. Topics include capacity and efficiency of mass transfer equipment and process energy requirements.

CH E 617 Colloids and Interfaces
★3 *(fi 6)* (either term, 3-0-0). Emphasis is on the basics of colloid and interfacial phenomena. Aimed at upper level and graduate students in chemical and mineral engineering, chemistry and geochemistry with an interest in application to the energy sector, mineral processing, materials handling, and chemical industry.

CH E 624 Advanced Thermodynamics
★3 *(fi 6)* (first term, 3-0-0). Principles of thermodynamics; properties of homogeneous fluid phases; phase and chemical equilibria; application to industrial problems.

CH E 625 Statistical Thermodynamics
★3 *(fi 6)* (either term, 3-0-0). Introduction to the principles of statistical thermodynamics. Construction of partition functions and calculations of basic thermodynamic properties for several fundamental systems. Applications include properties of ideal gases, ideal solids and adsorbed gases. Prerequisite: MEC E 640 or consent of Instructor.

CH E 631 Rheology of Polymers and Other Complex Fluids
★3 *(fi 6)* (either term, 3-0-0). General principles of liquid-state rheology. Modeling stress behavior in terms of continuum mechanics. Measurement techniques for nonlinear and viscoelastic properties, in shear and elongational flows. Interpretation of macroscopic properties of polymers in terms of molecular characteristics. Dynamical modeling of polymer chains in solutions and melts.

CH E 632 Polymer Melt Processing
★3 *(fi 6)* (either term, 3-0-0). Fluid mechanical fundamentals of melt processing operations. Extrusion, fibre spinning, calendering, moulding. Incorporation of continuum rheological models into equations of motion to predict behavior of engineering relevance. Description of anomalies arising from melt elasticity and methods of mitigating these.

CH E 634 Advanced Chemical Reactor Design
★3 *(fi 6)* (either term, 3-0-0). Design of homogeneous and heterogeneous reactors for isothermal and non-isothermal operation; analysis of rate data; transport processes in heterogeneous catalytic systems.

CH E 636 Advanced Chemical Kinetics and Catalysis
★3 *(fi 6)* (either term, 3-0-0). Gas phase reactions; kinetics in liquid solutions; characterization of catalysts; heterogeneous catalysts.

CH E 639 Polymer Engineering and Science
★3 *(fi 6)* (either term, 3-0-0). Polymerization; molar mass distributions and measurement; chain conformations; solution thermodynamics; amorphous and crystalline states; physical properties of melts, elastomers, and plastics; melt processing; mechanical properties.

CH E 645 Heterogeneous Catalysis and Reactor Analysis
★3 *(fi 6)* (either term, 3-0-0). Principles of heterogeneous catalysis and reactor analysis with emphasis on industrial catalytic reactions; characterization of heterogeneous catalysts.

CH E 646 Process Dynamics and Computer Process Control
★3.5 *(fi 6)* (first term, 3-0-3/3). An introductory graduate level course in process dynamics and control. Topics include dynamic process modeling, simulation, estimation, filtering, multiloop and multivariable control, plus stability and performance analysis.

CH E 655 Advanced Biomaterials Science
★3 *(fi 6)* (either term, 3-0-0). Intended for graduate students who are familiar with basic biomaterials science. Focuses on: molecular design of biomaterial and biomaterial surfaces in order to modulate specific biological events; techniques to modulate biomaterial properties; assessment techniques for modifications. The biological events will be studied at the cellular and molecular level.

CH E 662 Process Identification
★3.8 *(fi 6)* (either term, 3-0-3/2). Selected topics related to empirical modelling of process systems are undertaken. Emphasis on time-series based modelling theory and techniques, (e.g. nonparametric, parametric, spectrum analysis, nonlinear, and closed-loop identification methods), model validation, experimental design, and applications in forecasting, analysis, and control.

CH E 674 Numerical Solutions of Engineering Problems
★3 *(fi 6)* (second term, 3-0-0). Numerical solutions of engineering problems using linear and nonlinear sets of equations, ordinary and partial differential equations.

CH E 685 Graduate Seminar III
★1 *(fi 2)* (either term, 0-2s-0). Discussion of progress and problems in research in Chemical Engineering. Prerequisite: CH E 684.

CH E 686 Graduate Seminar IV
★1 *(fi 2)* (either term, 0-2s-0). Discussion of progress and problems in research in Chemical Engineering. Prerequisite: CH E 685.

CH E 689 Polymer Properties
★3 *(fi 6)* (either term, 3-0-0). Polymerization, molar mass distributions, polymer analytical techniques, solution and blend thermodynamics, physical and chemical properties of polymers, lattice models, rubber thermodynamics, polymer processing, fluid flow and heat transfer in melt processing, special polymer project. Prerequisite: consent of Instructor. Not open to students with credit in MATE 467 or CH E 539.

CH E 694 Advanced Topics in Chemical Engineering
★3 *(fi 6)* (either term, 3-0-0). An advanced treatment of selected chemical engineering topics of current interest to staff and students.

CH E 696 Special Topics in Process Dynamics and Computer Control
★3 *(fi 6)* (either term, 3-0-0). Advanced treatment of selected topics in process dynamics and/or computer process control of current interest to staff and students.

CH E 900 Directed Research Project
★3 *(fi 6)* (variable, unassigned).

221.36 Chemistry, CHEM

Department of Chemistry
Faculty of Science

Undergraduate Courses

CHEM 101 Introductory University Chemistry I
★3 *(fi 6)* (either term, 3-1s-3). Atoms and molecules, states of matter, chemistry of the elements. Prerequisite: Chemistry 30, or equivalent.

CHEM 102 Introductory University Chemistry II
★3 *(fi 6)* (either term, 3-1s-3). Rates of reactions, thermodynamics and equilibrium, electro-chemistry, modern applications of chemistry. Prerequisite: CHEM 101.

CHEM 103 Introductory University Chemistry I
★4.3 *(fi 6)* (either term, 3-1s-3/2). Atoms and molecules, states of matter, chemistry of the elements. Prerequisite: Chemistry 30, or equivalent. Note: Restricted to Engineering students only. Other students who take this course will receive ★3.0.

CHEM 105 Introductory University Chemistry II
★3.8 *(fi 6)* (either term, 3-0-3/2). Rates of reactions, thermodynamics and equilibrium, electrochemistry, modern applications of chemistry.Prerequisite: CHEM 103. Note: Restricted to Engineering students only. Other students who take this course will receive ★3.0.

CHEM 161 Organic Chemistry I
★3 *(fi 6)* (first term, 3-0-3). The study of basic molecular structure and reactivity of organic compounds based on their functional groups. Introduction to nomenclature, three dimensional structure, physical properties, and reactivity of compounds of carbon. Functional groups covered will emphasize alkanes, alkenes, alkynes, alkyl halides, alcohols, and some aromatics. Examples will include hydrocarbons (petroleum products), halogenated organic compounds (e.g. pesticides), and polymers of industrial importance which may be found in everyday life. Note: Students who already have credit in CHEM 101 and 102 should register in CHEM 261. Prerequisite: Chemistry 30 or equivalent.

CHEM 211 Quantitative Analysis I
★3 *(fi 6)* (first term, 3-0-4). Principles, methods, and experimental applications emphasizing solution phase equilibria, titrimetry, volumetric laboratory skills, and evaluation of experimental data. Includes examples of organic and inorganic analysis. Prerequisite: CHEM 102.

CHEM 213 Quantitative Analysis II
★3 *(fi 6)* (second term, 3-0-4). A continuation of CHEM 211 emphasizing the principles, methods, and experimental applications of separation techniques, atomic and molecular spectrometry, electrochemistry, and evaluation of experimental data. Includes examples of organic and inorganic analysis and use of the analytical literature. Prerequisite: CHEM 211.

CHEM 241 Inorganic Chemistry I
★3 *(fi 6)* (second term, 3-0-3). Bonding, structure and chemical properties of inorganic compounds with emphasis on the main group elements. Note: This course may not be taken for credit if credit has already been received in CHEM 330 or 331. For Chemistry Honors and Specialization students only, except by consent of Department. Prerequisites: CHEM 102 or 105 and CHEM 161 or 261.

CHEM 243 Inorganic Chemistry II
★3 *(fi 6)* (second term, 3-0-3). An extension of CHEM 241 with emphasis on the bonding, structure, and reactivity of transition-metal elements. Iincluded applications in industrial, biochemical, environmental, and materials science. For Chemistry Honours and Specialization students only, except by consent of Department. Note: This course may not be taken for credit if credit has already been received in CHEM 341. Prerequisites: CHEM 241 or consent of Department.

CHEM 261 Organic Chemistry I
★3 *(fi 6)* (first term, 3-0-3). The correlation of structure and chemical bonding in carbon compounds with the physical properties and chemical reactivity of organic molecules. Discussion will be based on functional groups with emphasis on hydrocarbons and derivatives that contain halogens, oxygen, sulfur, and the hydroxy group. Introduction to stereochemistry, three dimensional structure, reaction mechanisms, especially addition to double bonds, nucleophilic substitution and elimination reactions. Prerequisite CHEM 102 or 105. Note: Students who have obtained credit for CHEM 161 cannot take CHEM 261 for credit. Engineering students who take this course will receive ★4.5.

CHEM 263 Organic Chemistry II
★3 *(fi 6)* (second term, 3-0-3). Continuation of the structural and chemical properties of the basic functional groups of organic compounds including alkynes, aromatic compounds, aldehydes, ketones, carboxylic acids and their derivatives and amines. Illustration of these functional groups in natural products such as carbohydrates, amino acids and proteins, nucleic acids and lipids. Discussion of the application of spectroscopic methods for the structure determination in simple organic molecules. Prerequisites: CHEM 161 or 261. Note: Students who have obtained credit for CHEM 163 cannot take CHEM 263 for credit.

CHEM 282 Atomic and Molecular Structure
★3 *(fi 6)* (second term, 3-0-4). An introduction to the quantum view of nature with applications to atomic and molecular structure. Methods to describe the quantum world are introduced, used to describe simple electronic, vibrational and rotational structure of model systems, and applied to the hydrogen atom, many-electron atoms, simple diatomic molecules, and the electronic structure of polyatomic molecules. The laboratory portion of the course consists of practical applications enriching and illustrating the lecture material, and incorporates the use of computers as a routine aid to processing experimental results. Note: This course may not be taken for credit if credit has already been received in CHEM 381. Prerequisites: CHEM 102 or 105; one 200-level CHEM course; MATH 115; and PHYS 146 or 126.

CHEM 299 Research Opportunity Program in Chemistry
★1.5 *(fi 3)* (either term, 0-0-3). A credit/no-credit course for supervised participation in a faculty research project. Normally taken after completion of a minimum of 30 but not more than 60 units of course weight in a program in the Faculty of Science. Prerequisite: GPA of 2.5 or higher, CHEM 102; CHEM 163 or 263; and consent of department. Project and course information available at ROP website or Department of Chemistry. Prospective enrollees in CHEM 299 must apply to Department of Chemistry. Application does not guarantee an ROP position. Credit for this course may be obtained twice.

CHEM 303 Environmental Chemistry I
★3 *(fi 6)* (first term, 3-0-0). The chemistry of environmental processes. Atmospheric chemistry; thermal and photochemical reactions of atmospheric gases including oxygen, ozone, hydroxy radical, and oxides of nitrogen and sulfur. Aquatic chemistry; characterization, reactions, and equilibria of dissolved species, water purification treatments. Metals and organohalides in the environment. Risk assessment. Prerequisites: CHEM 102, 163 or 263; one 200-level CHEM course or CH E 243.

CHEM 305 Environmental Chemistry II
★3 *(fi 6)* (second term, 3-0-4). A continuation of CHEM 303 with laboratory applications. Experiments will illustrate and complement the principles and processes taught in CHEM 303 such as adsorption from aqueous solutions, convective/diffusive transport, vapour/solution equilibria, metal ion speciation with soil derived ligands, photochemistry, properties of aerosols, coagulation of colloids, sedimentation, ion exchange, computer modeling of complex systems, trace analysis of pesticides, chemical treatment of hazardous wastes. Quantitative calculations will be emphasized. The lecture component will provide theoretical background for experiments and instrumentation used for chemical measurements. There will be one or more field trips. Prerequisite: CHEM 163, or 263; CHEM 213 and either CHEM 303 or 273 or 373. Note: Restricted to students in the Environmental Physical Sciences and Chemistry (Honors, Specialization, and General Science with concentration in Chemistry) programs.

CHEM 311 Instrumental Analysis for Engineers
★3 *(fi 6)* (second term, 3-0-3). Fundamentals of volumetric, chromatographic, spectrographic, and electrochemical analysis. Volumetric techniques are covered briefly. Instrumental techniques discussed include gas and liquid chromatography, UV and IR spectroscopy, ion-selective electrodes and voltammetry. Emphasis is on the principles of each method, and the nature of matrix and other effects that influence the quality of the data obtained. Reference will be made to applications such as air and water quality, and process analyzers in manufacturing. Prerequisites: CHEM 261 and 271 or 371 or CH E 343. Note: Restricted to Engineering students only. Engineering students who take this course will receive ★4.5.

CHEM 313 Instrumentation in Chemical Analysis
★3 *(fi 6)* (first term, 3-0-4). Instrumentation and analytical applications of spectroscopic, chromatographic and electroanalytical methods are discussed and applied in the laboratory. Prerequisites: CHEM 213; 273 or 373; ★6 in junior Physics.

CHEM 333 Inorganic Materials Chemistry
★3 *(fi 6)* (either term, 3-0-3). Fundamentals of the synthesis, structure and properties of inorganic solids, thin films, and nanoscale materials, to be complemented with case studies of modern applications of inorganic materials; selected topics such as catalysis, molecular and nanoparticle-based computing, telecommunications, alternative energies, superconductivity, biomedical technologies, and information storage will be discussed. Techniques for characterization and analysis of materials on the nano and atomic level will be introduced. Prerequisite: CHEM 102 or 105; CHEM 163 or 263.

CHEM 361 Organic Chemistry
★3 *(fi 6)* (first term, 3-0-4). Mechanisms and reactions of aromatic and aliphatic compounds. Prerequisites: CHEM 102; CHEM 163 or 263.

CHEM 363 Organic Chemistry
★3 *(fi 6)* (second term, 3-0-4). A continuation of CHEM 361. Prerequisite: CHEM 361.

CHEM 371 Energetics of Chemical Reactions
★3 *(fi 6)* (first term, 3-0-3). A study of the implications of the laws of thermodynamics for transformations of matter including phase changes, chemical reactions, and biological processes. Topics include: thermochemistry; entropy change and spontaneity of processes; activity and chemical potential; chemical and phase equilibria; properties of solutions; simple one- and two-component phase diagrams. The conceptual development of thermodynamic principles from both macroscopic and molecular levels, and the application of these principles to systems of interest to chemists, biochemists, and engineers will be emphasized. Note: This course may not be taken for credit if credit has already been received in CHEM 271. Prerequisites: CHEM 102 or 105; MATH 101 or 115. Engineering students who take this course will receive ★4.5.

CHEM 373 Physical Properties and Dynamics of Chemical Systems
★3 *(fi 6)* (second term, 3-0-3). A continuation of CHEM 371 in which the physical properties of chemical systems and the dynamics and energetics of chemical processes are discussed. Topics include: colligative properties; electrochemical cells and ion activities, implications for ionic equilibria; kinetic theory and transport properties of gases and liquids; surfaces and colloid chemistry; reaction dynamics, detailed mechanisms of chemical reactions, catalysis. The emphasis will be on the development of principles of physical chemistry and their application to properties and processes of interest to chemists, biochemists, and engineers. Note: This course may not be taken for credit if credit has already been received in CHEM 273 or 275. Prerequisite: CHEM 371 or CHEM 271.

CHEM 383 Elements of Molecular Structure and Spectroscopy
★3 *(fi 6)* (second term, 3-0-4). The course is a continuation of CHEM 381 and introduces the student to the practical applications of quantum chemistry. The subjects will include: molecular orbital theories of the electronic structure of larger molecules, rotational spectroscopy, rotation-vibration spectroscopy, electronic spectroscopy of atoms and molecules, and magnetic resonance spectroscopy. Next, by using elements of statistical thermodynamics, the student will learn about the relation between the macroscopic thermodynamic properties of molecular systems, enthalpy, entropy and Gibbs free energy, and the microscopic molecular properties, energy levels. Prerequisite: CHEM 282 or 381.

CHEM 400 Industrial Internship Practicum
★3 *(fi 6)* (first term, 0-3s-0). Required by all students who have just completed a Chemistry Industrial Internship program. Must be completed during the first academic term following return to full-time studies. Note: A grade of F to A+ will be determined, by the student's job performance as evaluated by the employer,

by the student's performance in the completion of an internship practicum report, and by the student's ability demonstrated in an oral presentation. This course cannot be used in place of a senior-level CHEM option. Prerequisite: WKEXP 402.

CHEM 401 Introduction to Chemical Research
★3 *(fi 6)* (either term, 0-1s-8). Introduction to methods of chemical research. Investigational work under the direction of a member of the Department. The results of the research will be submitted to the Department as a report which will be graded. The student must also make an oral presentation of this work to the Department. For students in the fourth year of Honors or Specialization Chemistry. Students should consult with the Course Coordinator four months prior to starting the course. Prerequisites: a 300-level CHEM course and consent of the Course Coordinator.

CHEM 403 Chemical Research
★3 *(fi 6)* (either term, 0-1s-8). Investigational work under the direction of a member of the Department. Prerequisite or corequisite: CHEM 401.

CHEM 405 Special Topics in Chemistry
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: a 300-level CHEM course and consent of Instructor.

CHEM 413 Electronics, Noise, and Signal Processing
★3 *(fi 6)* (either term, 3-0-3). Linear electronics including operational amplifiers. Digital electronics including timing circuits, counters and logic. Fundamental and practical sources of noise in electronic circuits. Noise distributions. Data processing including filtering and linear and nonlinear regression analysis. Prerequisite: CHEM 313 and consent of Department.

CHEM 415 Analytical Electrochemistry
★3 *(fi 6)* (second term, 3-0-3). This course covers the theory and application of modern electroanalytical techniques including potentiometry, polarography and cyclic voltametry. Analytical applications of ion selective electrodes, chemically modified electrodes and other electrochemical sensors are also discussed. Introduction to electrode characterization with techniques such as scanning probe microscopy is also presented. Prerequisite: CHEM 313.

CHEM 417 Analytical Spectroscopy
★3 *(fi 6)* (second term, 3-0-3). Optical spectrochemical measurement systems are discussed including dispersive and interferometric spectrometers, detectors, lasers, readout systems and data processing. Techniques covered include all optical methods for analytical emission, absorption, luminescence and scattering measurements on atomic and molecular systems from the far-IR to the vacuum ultraviolet. Prerequisite: CHEM 313.

CHEM 419 Bioanalytical Chemistry
★3 *(fi 6)* (first term, 3-0-0). Introduction to biomolecules. Electrophoresis and process chromatography Protein and DNA sequence determination. Immunoassay. Restriction enzymes, vectors, and cloning. Good laboratory practice. Prerequisite: CHEM 313.

CHEM 421 Analytical Separations
★3 *(fi 6)* (first term, 3-0-0). The principles of phase-distribution processes, electrokinetic phenomena, column bandbroadening and extra-column bandbroadening are applied to commonly used modes of packed-bed and open-tubular gas and liquid chromatography and to capillary electrokinetic separations. Prerequisite: CHEM 313.

CHEM 423 Analytical Mass Spectrometry
★3 *(fi 6)* (either term, 3-0-0). An introduction to the principles, instruments, and applications of mass spectrometry for chemical and biochemical analysis. Topics discussed: vacuum systems; sample introduction methods; ionization methods; mass analyzers; tandem MS; ion detection; data system; mechanisms and techniques of ion fragmentation; interpretation of mass spectra; applications of mass spectrometry to environmental pharmaceutical, and biological samples. Prerequisite CHEM 313.

CHEM 433 Structure in the Solid State
★3 *(fi 6)* (first term, 3-0-0). An introduction to X-ray crystallography. This course covers the following topics: (1) the nature and origin of X-rays; (2) crystal symmetry; (3) diffraction theory; (4) theory and practical aspects of X-ray data collection; (5) Fourier analysis and structure solution; (6) least-squares refinement and other techniques used in structure solution; and (7) discussions and interpretations of X-ray structures from the literature. Prerequisite: CHEM 341.

CHEM 436 Synthesis and Applications of Inorganic and Nano-materials
★3 *(fi 6)* (either term, 3-0-0). Introduction to methods of synthesizing inorganic materials with control of atomic, meso-, and micro-structure. Topics include sol-gel chemistry, chemical vapor deposition, electro-synthesis of materials, solid-state reactions, solid-state metathesis and high-temperature self-propagating reactions, template-directed syntheses of micro- and meso-porous materials, micelles and colloids, synthesis of nanoparticles and nanomaterials. Applications of these synthetic techniques to applications such as photonic materials, heterogeneous catalysts, magnetic data storage media, nanoelectronics, display technologies, alternative energy technologies, and composite materials will be discussed. Prerequisites: CHEM 243 or 333.

CHEM 437 Transition Metal Chemistry
★3 *(fi 6)* (second term, 3-0-0). CHEM 437 is an introduction to organotransition metal chemistry. The course will deal with the synthesis, basic bonding, and reactivity of organotransition metal complexes. Topics to be covered include transition metal complexes of hydrides, phosphines, carbonyls, olefins, alkynes, polyolefins, cyclopentadienyl and related cyclic p-ligands; metal-carbon s-and multiple bonds. The application of these complexes to homogeneous catalysis and to organic synthesis will be discussed when appropriate. Prerequisite: CHEM 341.

CHEM 438 Solid State Chemistry
★3 *(fi 6)* (either term, 3-0-0). Introduction to the chemistry of extended inorganic solids. The topics covered include synthesis, symmetry, descriptive crystal chemistry, bonding, electronic band structures, characterization techniques, and phase diagrams. The correlation of structure with properties of electronic and magnetic materials will be discussed. Prerequisites: CHEM 243 or 333.

CHEM 439 Inorganic Reaction Mechanisms
★3 *(fi 6)* (first term, 3-0-0). Covers the mechanisms of reactions of transition metal compounds in solution. Detailed consideration is given to ligand substitution, isomerization, fluxional, photochemical and electron transfer reactions of coordination compounds and organometallic species. The application of kinetic and other methods to mechanistic elucidation are critically evaluated. Prerequisite: CHEM 341.

CHEM 444 Characterization Methods in Nanoscience
★3 *(fi 6)* (first term, 3-0-0). Introduction to techniques in determining the composition and structure of materials on the nanometer scale. Characterization of atomic, meso-, and micro-structure of materials including impurities and defects. Major topics will include diffraction (X-ray, electron, neutron), electron microscopy (transmission, scanning, and Auger) and associated spectroscopies (EDX, EELS), surface sensitive spectroscopies (e.g., XPS, AES, IR) and spectrometry (SIMS), synchrotron techniques, X-ray absorption, fluorescence and emission, and scanned probe microscopies (AFM, STM, etc.). The strengths, weaknesses, and complementarity of the techniques used will be examined via case studies on the characterization of real-world nanotechnologies, such as heterogeneous catalysts, surfaces and interfaces in semiconductor devices, organic monolayers on metals and semiconductors, nanotube- and nanowire-based electronics, and biocompatible materials. Prerequisites: 4th year standing or permission of Instructor.

CHEM 461 Qualitative Organic Analysis
★3 *(fi 6)* (second term, 3-0-4). Introductory graduate-level discussion of the physical techniques used in organic chemistry research for the separation/purification and structural elucidation of organic compounds. Emphasis is on the combined use of modern spectrometric techniques for structure determination, with particular focus on an introduction to modern NMR spectroscopy. Prerequisite: CHEM 363 or consent of Instructor.

CHEM 465 Physical Organic Chemistry
★3 *(fi 6)* (first term, 3-0-0). Graduate-level discussion of organic structural theories, intramolecular and intermolecular interactions in organic chemistry, and the mechanisms and reactive intermediates involved in organic reactions. Prerequisite: CHEM 363 or consent of Instructor.

CHEM 467 Advanced Organic Synthesis
★3 *(fi 6)* (first term, 3-0-0). A presentation of chemoselective, regioselective and stereoselective reactions of organic compounds, with an emphasis on modern methodology for organic synthesis. Prerequisite: CHEM 363 or consent of Instructor.

CHEM 477 Molecular Symmetry and Spectroscopy
★3 *(fi 6)* (either term, 3-0-0). Application of the principles of molecular symmetry to molecular properties. Topics include group theory with emphasis on vibrational motion and normal vibrations; quantum mechanics of vibration and rotation; magnetic resonance spectroscopy; perturbation methods; selection rules in rotational, infrared, and Raman spectroscopy; molecular symmetry and molecular orbitals; electronic spectroscopy of polyatomic molecules. Prerequisite: CHEM 383.

CHEM 479 Molecular Kinetics
★3 *(fi 6)* (second term, 3-0-0). Rate laws for simple and complex reactions, reaction mechanisms, potential energy surfaces, molecular dynamics, theories of reaction rates, catalysis, with application to gas and liquid phase reactions, photochemical reactions in chemistry and biology, and enzyme catalysis. Prerequisites: CHEM 273, MATH 215, PHYS 230, and a 300-level Chemistry course.

CHEM 483 Applications of Nuclear Magnetic Resonance
★3 *(fi 6)* (second term, 3-0-0). Theory of magnetic resonance spectroscopy and some of its applications to chemical systems. The curriculum includes: (1) a cursory discussion of first order NMR spectra; (2) quantum mechanics of spin systems and a quantum description of magnetic resonance experiments (the Bloch equations); (3) relaxation effects; (4) Fourier transform spectroscopy; (5) chemical exchange effects; (6) nuclear Overhauser effects; and (7) two-dimensional NMR. Prerequisite: CHEM 383.

CHEM 489 Biomolecular Spectroscopy
★3 *(fi 6)* (either term, 3-0-0). Focus is on electronic and vibrational spectroscopic techniques, and their application to biological molecules. Particular emphasis on the use of absorption, luminescence, infra-red, and Raman spectroscopies, and dichroic techniques in probing the structure and dynamics of biological molecules. A significant portion of the course will also include the general study of excited-state photophysics and photochemistry, with specific examples in biology. Prerequisite: CHEM 383.

CHEM 493 Computational Chemistry
★3 *(fi 6)* (either term, 3-0-0). Applications are stressed in this course which introduces the student to contemporary computational quantum chemistry to the Hartree-Fock limit, using state-of-the-art computer codes running on UNIX workstations. Elementary introduction to the UNIX operating system is given. Subjects include optimization of the geometry of molecules; prediction of molecular properties; calculation of infra-red and Raman spectra; solvent effects; thermochemistry of chemical reactions. Assignments in the course will allow the student to use advanced workstations and computer codes. Prerequisite: CHEM 383.

CHEM 495 Molecular Dynamics and its Applications
★3 *(fi 6)* (either term, 3-0-0). An introduction to Molecular Dynamics and its applications. The fundamentals of statistical mechanics are reviewed and computational tools such as molecular dynamics and Monte Carlo methods are presented. Applications include the study of structural properties of liquids, the diffusion of a solute in a solvent, the dynamics of proton transfer, and the calculation of rate constants. These topics will be exemplified using computer simulations as problem set assignments. Some lectures will take place in the computer laboratory where visualization tools will be used to illustrate various applications of molecular dynamics.

Graduate Courses

CHEM 502 Departmental Research Seminar
★0 *(fi 4)* (two term, 0-2s-0).

CHEM 504 Advanced Research Seminar
★0 *(fi 4)* (two term, 0-2s-0).

CHEM 523 Special Topics in Advanced Analytical Chemistry
★3 *(fi 6)* (either term, 3-0-0).

CHEM 531 Organometallic Chemistry
★3 *(fi 6)* (second term, 3-0-0). Prerequisite: CHEM 437 or consent of Department.

CHEM 533 Asymmetric Catalysis
★3 *(fi 6)* (either term, 3-0-0).

CHEM 545 Special Topics in Inorganic Chemistry
★3 *(fi 6)* (either term, 3-0-0).

CHEM 565 Special Topics in Physical Organic Chemistry
★3 *(fi 6)* (second term, 3-0-0). Advanced treatment of selected topics in modern physical organic chemistry, drawn from one or more of the following: (1) molecular recognition, (2) organic materials and devices, and (3) multidimensional NMR spectroscopic analysis. Other topic selections appropriate to the category may also be offered. Course may be repeated for credit, provided there is no duplication of specific topic. Prerequisite: CHEM 363 or consent of Instructor.

CHEM 567 Special Topics in Synthetic Chemistry
★3 *(fi 6)* (second term, 3-0-0). Advanced treatment of selected topics in modern synthetic organic chemistry, drawn from one or more of the following: (1) advanced methodology for organic synthesis, (2) carbohydrate structure and synthesis, (3) organometallic methodology for organic synthesis, and (4) solid-phase organic synthesis and combinatorial chemistry. Other topics appropriate to the category may also be offered. Course may be repeated for credit, provided there is no duplication of specific topic. Prerequisite: CHEM 363 or consent of Instructor.

CHEM 569 Special Topics in Bio-organic Chemistry
★3 *(fi 6)* (second term, 3-0-0). Advanced discussion of selected topics in modern bio-organic chemistry, drawn from one or more of the following: (1) natural products and secondary metabolism, (2) nucleic acid chemistry, and (3) organic and biophysical carbohydrate chemistry. Other topics appropriate to the category may also be offered. Course may be repeated for credit, provided there is no duplication of specific topic. Prerequisite: CHEM 363 or consent of Instructor.

CHEM 581 Special Topics in Physical Chemistry
★3 *(fi 6)* (second term, 3-0-0). Prerequisite: consent of Department.

CHEM 599 Fundamentals and Applications of Mass Spectrometry
★3 *(fi 6)* (second term, 3-0-0). Recent advances in ion sources and mass analyzers have transformed mass spectrometry (MS) into a dominant research tool in many areas of chemistry and biochemistry. The objective of this course is to provide students with an understanding of the theory underlying the operation and application of MS to diverse chemical and biochemical problems. Emphasis will be placed on the role of gas-phase ion chemistry in MS experiments. The first part of this course will deal with the operating principles of the different types of mass analyzers, as well as the ionization techniques used to generate gas-phase ions. The second part of the course will examine chemical applications of MS. Included will be a detailed discussion of the dissociation techniques used to obtain structural information. Prerequisite: CHEM 383.

221.37 Chimie, CHIM

Faculté Saint-Jean

Cours de 1er cycle

CHIM 101 Introduction à la chimie I
★3 *(fi 6)* (premier semestre, 3-1s-3). Structure atomique, liaisons covalentes, thermochimie, équilibre chimique, acides et bases, les éléments représentatifs. Préalable(s): Chimie 30 ou l'équivalent.

CHIM 102 Introduction à la chimie II
★3 *(fi 6)* (deuxième semestre, 3-1s-3). Etats de la matière et forces intermoléculaires, solubilité et solutions, électrochimie, thermodynamique chimique, cinétique chimique, liaison et propriétés des métaux de transition. Préalable(s): CHIM 101.

CHIM 103 Introduction à la chimie I
★3 *(fi 6)* (l'un ou l'autre semestre, 3-1s-3/2). Stoechiométrie, gaz parfaits, thermochimie, équilibre chimique, acides et bases, structure atomique et liaison chimique. Préalable(s): Chimie 30 ou l'équivalent. Note: Ce cours est réservé aux étudiants de génie.

CHIM 105 Introduction à la chimie II
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-3/2). Solubilité, cellule électrochimique et équation de Nernst, cinétique chimique, modes de liaison et structure, cinétique chimique, modes de liaison et structure, chimie des éléments de transition. Préalable(s): CHIM 103. Note: Ce cours est réservé aux étudiants de génie.

CHIM 161 Chimie organique I
★3 *(fi 6)* (premier semestre, 3-0-3). Etude de la structure moléculaire et de la réactivité des composés organiques basée sur leurs groupes fonctionnels. Introduction à la nomenclature, la structure tridimensionnelle, les propriétés physiques, et réactivité des composés de carbone. L'accent sera mis sur les alcanes, les alcènes, les alcynes, les halogénures d'alkyle, les alcools, et certains composés aromatiques. Les exemples comprendront les hydrocarbures (produits pétroliers) composés organiques halogénés (pesticides), et les polymères d'une importance industrielle que l'on retrouve dans la vie de tous les jours. Note: Les étudiants ayant des crédits en CHIM 101 et 102 devront normalement suivre CHIM 261. Préalable(s): Chimie 30 ou l'équivalent.

CHIM 163 Chimie organique II
★3 *(fi 6)* (deuxième semestre, 3-0-3). Continuation de l'étude de la structure et réactivité des groupes fonctionnels avec accent sur les molécules importantes en biologie (corps gras, sucres, médicaments, antibioltiques, amino-acides, protéines, acides nucléiques). L'accent sera mis sur les alcools, les composés aromatiques, les composés carbonylés (les aldéhydes, les cétones, les dérivés des acides carboxyliques), et les amines. Discussion des molécules de tous les jours (savons, détergents, fibres, parfums et biopolymères). Préalable(s): CHIM 161.

CHIM 261 Chimie organique I
★3 *(fi 6)* (premier semestre, 3-0-3). Corrélation des structures et des liaisons chimiques des composés de carbone avec les propriétés physiques et la réactivité chimique des molécules organiques. Etude des groupes fonctionnels. L'accent sera mis sur les hydrocarbures et leurs dérivés qui contiennent les hétéroatomes (halogènes, oxygène, souffre, et groupe hydroxy). Introduction à la stéréochimie, la structure tridimensionnelle, les mécanismes, en particulier addition aux doubles liaisons, substitution nucléophile et réactions d'élimination. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour CHIM 161. Préalable(s): CHIM 100 ou 102.

CHIM 263 Chimie organique II
★3 *(fi 6)* (deuxième semestre, 3-0-3). Continuation de l'étude des propriétés structurales et chimiques des groupes fonctionnels avec l'accent sur les alcynes, les composés aromatiques, les aldéhydes, les cétones, les acides carboxyliques et leurs dérivés, et les amines. Exemples de ces groupes fonctionnels dans les produits naturels; les hydrates de carbone, les amino-acides et les protéines, les acides nucléiques, et les lipides. Etude de la déduction des structures des molécules organiques par spectroscopie infrarouge et spectroscopie de résonance magnétique nucléaire. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour CHIM 163. Préalable(s): CHIM 261.

221.38 Chinese, CHINA

Department of East Asian Studies
Faculty of Arts

Undergraduate Courses

Notes
(1) The Department reserves the right to place students in the language course appropriate to their level of language skill.

(2) Placement tests may be administered in order to assess prior background. Students with an Asian (Chinese, Japanese, Korean) language background should consult a Department advisor. Such students may be granted advanced placement and directed to register in a more advanced course suitable to their level of ability or they may be encouraged to seek "Credit by Special Assessment" (see §44.5) when appropriate.

(3) The Department will withhold credit from students completing courses for which prior background is deemed to make them ineligible. For example, 100-level courses are normally restricted to students with little or no prior knowledge in that language. Should a student with matriculation standing, or those possessing prior background (such as native speakers or those for whom it is their first language) register in the 100-level courses, credit may be withheld.

O CHINA 101 Basic Chinese I
★3 *(fi 6)* (either term, 0-5L-0). A non-intensive introduction to Mandarin Chinese. Note: Not open to students with matriculation in Chinese, i.e., CHINA 30 or equivalent.

O CHINA 102 Basic Chinese II
★3 *(fi 6)* (either term, 0-5L-0). A continuation of CHINA 101. Prerequisite: CHINA 101. Note: Not open to students with matriculation in Chinese, i.e., CHINA 30 or equivalent.

O CHINA 201 Basic Chinese III
★3 *(fi 6)* (either term, 0-5L-0). A continuation of CHINA 102. Designed to develop further basic skills in spoken and written Chinese. Prerequisite: CHINA 102.

O CHINA 202 Basic Chinese IV
★3 *(fi 6)* (either term, 0-5L-0). A continuation of CHINA 201. Designed to develop further basic skills in spoken and written Chinese. Prerequisite: CHINA 201.

O CHINA 211 Mandarin Chinese I
★3 *(fi 6)* (first term, 3-0-1). Designed for speakers proficient in one of the regional dialects of Chinese to gain fluency in the standard Mandarin. Prerequisite: Proficiency in any of the original dialects of China.

O CHINA 212 Mandarin Chinese II
★3 *(fi 6)* (second term, 3-0-1). Continuation of CHINA 211. Prerequisite: CHINA 211.

O CHINA 220 Body, Mind and World in Chinese Culture
★3 *(fi 6)* (either term, 3-0-0). Chinese cultural pursuits and the construction of Chinese traditional world view. Readings and lectures in English. Note: This course does not fulfill the language other than English requirement of the BA degree.

CHINA 238 Contrastive Analysis of Chinese and English
★3 *(fi 6)* (either term, 3-0-0). Introduction to the grammatical structures, syntax, and semantics of Chinese and English. Prerequisite: CHINA 202 or consent of Department.

CHINA 270 The Chinese Language in its Cultural Setting I
★6 *(fi 12)* (two term, 15-0-0). A language/cultural immersion course offered in China. Designed to improve oral/aural skills and increase understanding of Chinese people and culture. Note: Offered in alternate years. CHINA 280 and 380 may not both be taken for credit.Prerequisite: CHINA 202 or consent of Department. Not open to students with credit in CHINA 350.

O CHINA 301 Intermediate Chinese I
★3 *(fi 6)* (first term, 0-4L-0). Continuing study of spoken and written modem standard Chinese. Conversation and composition are integrated with reading and discussion of texts of modem Chinese prose, fiction, and other kinds of writing. Prerequisite: CHINA 200, 202, or 280.

O CHINA 302 Intermediate Chinese II
★3 *(fi 6)* (second term, 0-4L-0). A continuation of CHINA 301. Prerequisite: CHINA 301.

O CHINA 309 Drama and Film in Chinese
★3 *(fi 6)* (first term, 3-0-0). Designed to be taken in conjunction with CHINA 301 to further develop Chinese speaking and writing skills through study of film and drama. Prerequisite: CHINA 202. Formerly CHINA 407.

O CHINA 318 Business Chinese I
★3 *(fi 6)* (either term, 3-0-0). Intermediate level of modern standard Chinese with emphasis on the vocabulary and communication style of the Chinese business world. Prerequisite: CHINA 202 or consent of Department.

O CHINA 319 Business Chinese II
★3 *(fi 6)* (either term, 3-0-0). Modern standard Chinese with emphasis on the vocabulary and communication style of the Chinese business world. Readings from newspapers and other media. Prerequisite: CHINA 318 or consent of Department.

CHINA 321 Pre-modern Chinese Lierature in English Translation
★3 *(fi 6)* (either term, 3-0-0). Chinese Literature from earliest times through the Qing Dynasty. Readings and lectures in English. Note: Does not fulfil any Faculty of Arts Language other than English requirement. Not open to students with credit in China 323.

CHINA 322 Modern Chinese Literature in English Translation
★3 *(fi 6)* (either term, 3-0-0). Chinese literature from 1912 to 1949. Readings and lectures in English. Prerequisite: CHINA 321 or consent of the Department. Note: Does not fulfill any Faculty of Arts Language other than English requirement. Not open to students with credit in CHINA 427.

O CHINA 337 Women in Modern Chinese Literature and Film
★3 *(fi 6)* (either term, 3-0-0). Roles of women as writers/filmmakers and as subjects within literary works and movies. Readings and lectures in English. Note: This course does not fulfill the Language other than English requirement of the BA degree.

O CHINA 338 Identity and Social Change in Contemporary China
★3 *(fi 6)* (either term, 3-0-0). Colonialism, post-colonialism, modernity, ethnicity/ minority issues, cultural stereotypes, and family relationships. Readings and lectures in English. Note: This course does not fulfill the Language other than English requirement of the BA.

O CHINA 339 Autobiography, Memoir, and Biography
★3 *(fi 6)* (either term, 3-0-0). Concentration on the post-1949 period. Literary, socio-political and historical contexts. Readings and lectures in English. Note: This course does not fulfill the Language other than English requirement of the BA degree.

O CHINA 341 Classical Chinese I
★3 *(fi 6)* (first term, 3-0-0). An introduction to the syntax and semantic structures of classical Chinese. Prerequisite: CHINA 200 or 202.

O CHINA 342 Classical Chinese II
★3 *(fi 6)* (second term, 3-0-0). A continuation of CHINA 341. Prerequisite: CHINA 341.

CHINA 370 The Chinese Language in its Cultural Setting II
★6 *(fi 12)* (two term, 15-0-0). A language/culture immersion course offered in China. Designed for improving of oral/aural skills and increasing understanding of Chinese people and culture. Note: Offered in alternate years. CHINA 280 and 380 may not both be taken for credit. Prerequisite: CHINA 302 or consent of Department. Not open to students with credit in CHINA 450.

O CHINA 401 Advanced Chinese I: Chinese in Mass Media
★3 *(fi 6)* (either term, 3-0-0). Chinese language through contemporary film, television programs and newspapers. Prerequisite: CHINA 302 or consent of Department.

O CHINA 402 Advanced Chinese II: Literature and Society
★3 *(fi 6)* (either term, 3-0-0). Development of language skills through reading modern fiction and/or non-fiction. Introduction to important issues and themes in modern Chinese society and literature. Readings in Chinese; lectures in English and/or Chinese. Prerequisite: CHINA 401 or consent of Department.

O CHINA 410 Classical Chinese Poetry
★3 *(fi 6)* (either term, 3-0-0). Emphasis on the production of poetry as a cultural object. Note: Not open to students with credit in CHINA 423. Prerequisite: Any 300-level literature course or consent of Department.

O CHINA 414 Chivalric Tales and Love Stories
★3 *(fi 6)* (either term, 3-0-0). Language and literary conventions in vernacular fiction and drama. Readings in Chinese; lectures in English and/or Chinese. Prerequisite: CHINA 302 or consent of Department.

O CHINA 420 Chinese Modernity: Literature and Film
★3 *(fi 6)* (either term, 3-0-0). A cross-disciplinary study of literary and cinematic texts from modern China. Prerequisite: CHINA 402 and/or consent of Department.

O CHINA 425 Post-Mao Fiction
★3 *(fi 6)* (either term, 3-0-0). A discussion of the major literary trends and the fictional works of important writers who have emerged in the post-Mao era (since 1976). Readings and lectures in English. Prerequisite: Any 300-level literature course or consent of Department.

CHINA 428 Chinese-English Translation
★3 *(fi 6)* (either term, 3-0-0). Theory and practice in translation as applied to Chinese and English literary and non-literary texts. Prerequisite: CHINA 401 or consent of Department.

CHINA 438 Practical Translation
★3 *(fi 6)* (either term, 3-0-0). The practice of translation in media, government, and business. Prerequisite: CHINA 302 or consent of Department.

O CHINA 455 Topics in Taiwan Literature
★3 *(fi 6)* (either term, 3-0-0). Readings in Taiwan literature with emphasis on tradition, theme, and technique. Readings in Chinese; lectures in English and/or Chinese. Prerequisite: CHINA 302.

CHINA 480 Topics in Chinese Studies
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: ★6 of senior courses in Chinese or consent of Department.

CHINA 483 Supervised Readings in Chinese
★3 *(fi 6)* (either term, 3-0-0). Accelerated reading course primarily for senior and

graduate students in special area of need or interest. Prerequisite: Consent of Department. Note: Not open to students with credit in CHINA 481.

CHINA 490 Honors Thesis
★3 *(fi 6)* (either term, 3-0-0).

Graduate Courses

CHINA 500 Topics in Chinese Language
★3 *(fi 6)* (either term, 3-0-0). A reading knowledge of Chinese is required.

CHINA 501 Methods of Research: Pre-Modern
★3 *(fi 6)* (either term, 3-0-0). Sinology; historical and critical approaches to pre-modern Chinese literature. A reading knowledge of Chinese is required.

CHINA 502 Methods of Research: Modern
★3 *(fi 6)* (either term, 3-0-0). Sinology; historical and critical approaches to modern Chinese literature. A reading knowledge of Chinese is required.

CHINA 510 Reading Tang-Song Poetry
★3 *(fi 6)* (either term, 3-0-0). Conventions of writing poetry in China in contrast to those in the western world.

CHINA 520 Modernism and Twentieth-Century Literature
★3 *(fi 6)* (either term, 3-0-0). Themes and preoccupations of the Modernist movement as they are appropriated and transformed by Chinese writers.

CHINA 552 Topics in Modern Chinese Literature
★3 *(fi 6)* (either term, 3-0-0). Major literary trends and contemporary literature from post-Mao China and Taiwan. Readings in Chinese; lectures in English and/or Chinese.

CHINA 599 Topics in Chinese Literature
★3 *(fi 6)* (either term, 3-0-0). Survey of major topics in Chinese literature, pre-modern and modern. CHINA 599 must be taken at least once and may be repeated for credit when course content differs. A reading knowledge of Chinese is required.

221.39 Christian Theology at St Joseph's College, CHRTC

St Joseph's College

Note: The following courses can be used as Arts options.

Undergraduate Courses

O CHRTC 100 The Bible and the Origins of the Christian Church
★3 *(fi 6)* (either term, 3-0-0). A study of the basic themes of the Christian bible; creation and covenant; sin and evil; the biblical history of ancient Israel; the prophets and justice; the preaching, death, and resurrection of Jesus Christ; redemption; the emergence of the Church.

O CHRTC 172 Introduction to Catholic Moral Thought
★3 *(fi 6)* (either term, 3-0-0). An introduction to the major themes in Catholic moral reflection with application to some contemporary issues. The meaning of morality and Christian conversion; the role of experience, the Bible, the Church, moral norms, the development of conscience, and personal responsibility. Formerly CHRTC 272.

O CHRTC 250 The Theological Education of the Catholic Teacher
★3 *(fi 6)* (either term, 3-0-0). The components that make up the education of the Catholic teacher. Issues include credal statements, the moral and social teachings of the Church, liturgical practices, a general theology and theory of Catholic education.

O CHRTC 264 Dimensions of the Christian Faith
★3 *(fi 6)* (either term, 3-0-0). What is Christianity? An introduction to the major dimensions of Christianity, such as revelation, faith, Scripture, God, Jesus as Lord and Saviour, with reflection on them in light of contemporary human experience. Formerly CHRTC 364.

O CHRTC 266 Jesus in the New Testament
★3 *(fi 6)* (either term, 3-0-0). Exploring the person of Jesus through studying the four Gospels, Paul, and later New Testament writers, with reflection on such recent approaches as liberation theology, feminist exegesis, and the Jesus-seminar.

CHRTC 267 The Letters of the New Testament: Sin, Suffering, Signs, and Hope
★3 *(fi 6)* (either term, 3-0-0). A theological and scriptural exploration of four central themes of these New Testament writings and their contemporary relevance.

O CHRTC 270 The Catholic Church Today
★3 *(fi 6)* (either term, 3-0-0). A study of how the Catholic Church understands itself today, its relationships with other Christians and with non-Christians, and its role in the contemporary world. Formerly CHRTC 370.

O CHRTC 292 Spirituality for Today's Christian
★3 *(fi 6)* (either term, 3-0-0). Developing an understanding of the role of prayer, leisure, and work within a Christian lifestyle in the light of Scripture, Christian tradition, current theological reflection, and personal differences.

O CHRTC 341 Contemporary Film and Christian Values
★3 *(fi 6)* (either term, 3-0-0).). Theological themes arising out of contemporary film. Themes may include relationships, family, gender, possessions, work freedom, violence, suffering, death, happiness, and hope.

O CHRTC 349 Christianity and Social Justice in Canada
★3 *(fi 6)* (either term, 3-0-0). An examination of particular social justice issues related to the economy, women, native peoples, the environment, etc., in light of Catholic social teachings and other Christian perspectives; social action strategies, and education for social justice.

O CHRTC 350 Science and Religion: Christian Perspectives
★3 *(fi 6)* (either term, 3-0-0). An examination of science and religion; their historical relationship, current issues (e.g., the evolution vs creation debate, scientific and religious knowledge, the nature of science and religion, cosmology) and contemporary attempts to address them.

O CHRTC 351 Human Sexuality and Marriage: Christian Perspectives
★3 *(fi 6)* (either term, 3-0-0). Questions of meaning and morality concerning human sexuality and marriage, including love, non-marital sex, divorce, parenthood, and gender roles, considered in light of human experience. Scripture, Christian Tradition, Catholic Church teaching, and contemporary theological discussion.

O CHRTC 352 Bioethical Issues: Christian Perspectives
★3 *(fi 6)* (either term, 3-0-0). Reproductive and genetic technologies, abortion, transplantation, resource allocation, research, withdrawing treatment, personal directives, euthanasia, considered in light of human experience. Catholic Church teaching, other Christian perspectives and contemporary ethical discussion.

O CHRTC 353 Christian Perspectives on Imaginative Literature
★3 *(fi 6)* (either term, 3-0-0). The author's milieu, context of the work, Christian content, and how the work deals with Christian values, beliefs, spirituality, conscience.

O CHRTC 354 The Gospels of Matthew, Mark, and Luke
★3 *(fi 6)* (either term, 3-0-0). A comparison of the Gospels of Matthew, Mark, and Luke to determine their theological and pastoral orientations in proclaiming the Jesus tradition to the developing Christian communities. Not open to students with credit in CHRTC 355 or 356 or 357.

O CHRTC 355 The Catechism of the Catholic Church: Theological Perspectives
★3 *(fi 6)* (either term, 3-0-0). Scripture, the moral life, systematic theology, social teachings, catechesis, the spiritual life in the New Catechism, and the relationship between an official Catechetical text and Catholic theological development.

O CHRTC 356 Theologies of Christian Religious Education
★3 *(fi 6)* (either term, 3-0-0). Pluralism, multiculturalism, and ecumenism in relation to Christian religious education including tradition, Scripture, the Church, the person, the mission of the Church in the world, as well as the influence of the wider culture upon the development of theologies of education.

O CHRTC 371 The Sacraments
★3 *(fi 6)* (first term, 3-0-0). The role of the sacraments in Christian life and worship. The sacraments as mysteries of salvation and as community celebrations. Relationships among the various sacraments. Historical development and current understandings of specific sacramental rites.

O CHRTC 380 Christian Religious Education and the Child
★3 *(fi 6)* (either term, 3-0-0). Key themes relevant to the faith life of children, such as: the presence of God, a sense of belonging, the need for community. Examination of selected Alberta school curriculum topics.

O CHRTC 381 Christian Religious Education and the Adolescent/Young Adult
★3 *(fi 6)* (either term, 3-0-0). Key themes relevant to the faith search of adolescents/young adults, such as: the life and teachings of Jesus, the challenge of the Gospel in our culture, and the meaning of belonging and commitment to Church. Examination of selected Alberta school curriculum topics.

O CHRTC 390 Neuroscience, the Person and Christian Theology
★3 *(fi 6)* (either term, 3-0-0). Interdisciplinary study of personhood and related topics: animal/human consciousness; body/soul, mind/brain, sexuality/gender, and relationship issues; religious and mystical experiences.

O CHRTC 391 Women's Spirituality in Contemporary Christianity
★3 *(fi 6)* (either term, 3-0-0). Women's experience of God and the Christian life expressed in the history of spirituality, personal faith development and contemporary culture.

O CHRTC 394 Business Ethics: Christian Perspectives
★3 *(fi 6)* (either term, 3-0-0). A theological study of ethical issues in business settings, dealing with such themes as employer-employee relations, job security, advertising, distribution of wealth, acquisitive individualism, the common good; decisions on ethical issues in light of contemporary Catholic teaching.

O CHRTC 396 Environmental Issues: Christian Perspectives
★3 *(fi 6)* (either term, 3-0-0). A theological study of ethical issues concerning our human relationship to the planet earth: responsible stewardship, non-renewable resources, pollution, the use of technology.

O CHRTC 407 Topics in Christian Religious Education
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: CHRTC 380 or 381 or consent of the College.

O CHRTC 432 Advanced Bioethics
★3 *(fi 6)* (either term, 3-0-0). A theological analysis of selected bioethical issues such as defective newborns, allocation of scarce medical resources, suffering and death. Prerequisite: CHRTC 352 or consent of the College.

O CHRTC 449 Field Placement in Christian Service
★3 *(fi 6)* (either term, 0-8s-0). Supervised work experience in approved Christian social agencies with seminars and a major paper integrating the theological literature with issues raised by social action and placement experiences. Prerequisite: CHRTC 349 or consent of the College.

O CHRTC 450 Directed Readings in Catholic Theology
★3 *(fi 6)* (either term, 3-0-0). An intensive directed readings course on a topic selected by the student in consultation with one of the faculty. A major term paper is required. Prerequisites: One course in Christian theology and permission of the College.

O CHRTC 451 Modern Creationisms
★3 *(fi 6)* (either term, 3-0-0). Critical analysis of the creation-evolution debate in light of scientific evidence and modern biblical scholarship. Prerequisite: CHRTC 350 or consent of the College.

221.40 Christian Theology at St Stephen's College, CHRTP

St Stephen's College

Note: The following courses can be used as Arts options.

Undergraduate Courses

O CHRTP 301 Hebrew Scriptures
★3 *(fi 6)* (first term, 3-0-0). Background, authorship, sources, literary qualities and general teaching of the various books of the Hebrew Scriptures (Old Testament), and the process of the Old Testament formation. Note: Not open to students with credit in CHRTP 301 Old Testament Literature.

O CHRTP 305 Christian Scriptures
★3 *(fi 6)* (second term, 3-0-0). Jewish and Greek environment of the New Testament; the authorship and content of its various books, and the process of New Testament formation. Note: Not open to students with credit in CHRTP 305 New Testament Literature.

O CHRTP 312 The Question of Faith
★3 *(fi 6)* (first term, 0-3s-0). An introduction to a methodology for a disciplined examination of issues in contemporary religious experience with reference to selected readings from leading thinkers.

O CHRTP 313 Topics in Applied Christian Ethics
★3 *(fi 6)* (either term, 3-0-0). Exploration and analysis of selected issues in social ethics within the context of theological reflection and commitment. Particular attention will be paid to the development of debate within the Protestant tradition.

O CHRTP 314 Topics in Women and Religion
★3 *(fi 6)* (either term, 3-0-0). Women's relation to and place in the dominant religious tradition of the West, Christianity. Attention will be paid to women's attempts to critique and transform received tradition and/or to develop alternative forms of religious life.

O CHRTP 315 Topics in Religion and Literature
★3 *(fi 6)* (either term, 3-0-0). Religious systems mediate their values and concerns in a variety of ways (liturgy, mythos, theology, etc.). This course investigates major Christian concerns such as doubt, faith, suffering, hope, forgiveness and redemption as mediated through narrative. In addition to exploring deep questions of religious meaning, attention will also be paid to the transmission and transformation of values, and the use of literature as a religious vehicle for social change.

O CHRTP 316 Issues in Contemporary Sexuality and Spirituality
★3 *(fi 6)* (second term, 2-1s-0). A study of selected beliefs concerning sexuality and spirituality in the light of contemporary theories and debates.

O CHRTP 317 New Issues in Theology
★3 *(fi 6)* (either term, 3-0-0). A survey course exploring recent developments in Christian Theology and their implications for traditional beliefs, symbols, and the integration of faith and practice.

O CHRTP 318 Feminist Theology
★3 *(fi 6)* (first term, 1-2s-0). An examination of feminist criticisms of selected doctrines and practices.

O CHRTP 418 The Makers of Modern Theology
★3 *(fi 6)* (either term, 0-3s-0). A study of the major works of a key theologian of the 19th or 20th century.

221.41 Civil Engineering, CIV E

Department of Civil and Environmental Engineering
Faculty of Engineering

The following courses were renumbered effective 2000/2001

Old	New	Old	New
CIV E 506	CIV E 406	CIV E 540	CIV E 439
CIV E 404	CIV E 409	CIV E 574	CIV E 479
CIV E 521	CIV E 429	CIV E 591	CIV E 489

Undergraduate Courses

CIV E 221 Environmental Engineering Fundamentals
★3.8 *(fi 6)* (second term, 3-0-3/2). Basic mechanisms of chemistry, biology, and physics relevant to environmental engineering processes. Principles of equilibrium reactions and kinetics, mass transfer and material balances, microbial growth and kinetics, water, energy, and nutrient cycles. Applications to environmental engineering systems as biological degradation, mass and energy movement through the environment, and design of water and wastewater treatment systems. Prerequisites: CHEM 103 and CHEM 105.

CIV E 240 Technical Communications
★2 *(fi 6)* (second term, 1-2s-0). Written and oral communications in civil engineering; lectures and practice on presentation of oral and written reports, including: technical proposals; progress reports; field inspection reports; and consulting reports. Seminars and practice in developing effective search strategies for technical information. A written report must be submitted by each student.

CIV E 250 Plane Surveying
★4 *(fi 6)* (either term, 3-0-2). Basic surveying concepts and instrumentation, measurement errors, coordinate systems, leveling, traversing, layout surveys, earthwork volumes, conventional, and digital mapping, GIS concepts, aerial photography, and GPS. Prerequisites: MATH 101 and 102.

CIV E 251 Survey School
★2 *(fi 6)* (second term or Spring/Summer, 2 weeks). Practical exercises in field methods; project type of assignments; field astronomy; electronic distance measuring instruments. Note: Survey School is held off campus. Prerequisite: CIV E 250.

CIV E 265 Engineering Drawing and Computer Graphics
★3.5 *(fi 6)* (either term, 2-0-3). Multiview representation, pictorial views of three-dimensional objects. Computer-aided graphics using AutoCAD.

CIV E 270 Mechanics of Deformable Bodies I
★4.5 *(fi 6)* (either term, 3-0-3). Plane stress and strain; stress-strain relationships; stresses and deformations resulting from axial and transverse loads; buckling of columns; torsion of circular sections; combined stress; statically indeterminate problems. Laboratory to demonstrate mechanical properties and verify assumptions of analysis. Prerequisites: ENGG 130 and MATH 101.

CIV E 290 Civil Engineering Analysis I
★3 *(fi 6)* (second term, 3-0-0). Statistical and probabilistic approaches to civil engineering problems. Prerequisites: ENCMP 100, MATH 101.

CIV E 295 Civil Engineering Analysis II
★4 *(fi 6)* (second term, 3-0-2). Application of numerical methods to civil engineering problems. Prerequisites: ENCMP 100, MATH 102 and 209.

CIV E 303 Project Management
★3.8 *(fi 6)* (either term, 3-0-3/2). Planning and scheduling; theories and techniques of project management.

CIV E 312 Transportation Engineering
★3 *(fi 6)* (either term, 3-0-0). Transportation systems and their elements. Population and transportation in Canada. Principles of transportation planning. Traffic volume, capacity, speed, density, and safety. Fundamentals of traffic control and public transport. Economic and environmental evaluation in transportation planning and operations design. Principles of transportation systems management.

CIV E 315 Transportation Engineering
★4 *(fi 6)* (either term, 3-0-2). Transportation systems and their elements. Principles of transportation planning. Traffic volume, capacity, speed, density, and safety. Fundamentals of traffic control. Principles of highway planning. Highway and terrain. Vehicular motion. Horizontal and vertical geometric design. Cost/benefit analysis in highway design. Earthwork and mass diagram. Flexible and rigid pavement design. Prerequisite: CIV E 250; pre- or corequisite: CIV E 391.

CIV E 321 Principles of Environmental Modeling and Risk
★3.8 *(fi 6)* (either term, 3-0-3/2). Introduction modeling environmental processes to predict the movement of water and fate of contaminants in the hydrologic cycle. Principles of mass transfer, conservation of mass, environmental transformations, nutrient enrichment and depletion are developed. Introduction to storm events, rainfall, runoff, stream discharge and stormwater management. Applications of modeling results to the quantification of risk using examples from hydrology, water pollution and health protection and development of environmental regulations. Prerequisite: CIV E 221. Corequisite: CIV E 330.

CIV E 330 Introduction to Fluid Mechanics
★3.5 *(fi 6)* (either term, 3-1s-0). Fluid properties; dimensional analysis; hydrostatics; fundamental equations of fluid motion; laminar, turbulent and inviscid flows; boundary layers and flow around immersed bodies; elementary building aerodynamics. Prerequisites: MATH 201 and 209.

CIV E 331 Applied Hydraulics
★3.8 *(fi 6)* (either term, 3-0-3/2). Introduction to applied hydraulics; control volume methods, open channel hydraulics, pipe systems, pumps, distribution and collection system hydraulics and design. Prerequisite: CIV E 330, and either CIV E 221 or ENV E 222.

CIV E 372 Structural Analysis I
★4 *(fi 6)* (either term, 3-2s-0). Introduction to structural loads; deformations of statically determinate beams, trusses and frames; influence lines; analysis of statically indeterminate structures by consistent deformations, slope deflection and moment distribution; direct stiffness analysis. Prerequisite: CIV E 270.

CIV E 374 Structural Design I
★4.5 *(fi 6)* (either term, 3-0-3). Introduction to limit states design. Behavior and design of steel and reinforced concrete members. Prerequisite: CIV E 372.

CIV E 381 Soil Mechanics
★4.5 *(fi 6)* (either term, 3-0-3). Compaction; site investigation; theories of water seepage; effective stress principles; settlement; strength and mechanical properties; introduction to retaining structures, foundation, and slope stability. Prerequisites: EAS 210 and CIV E 295.

CIV E 391 Civil Engineering Materials
★4.5 *(fi 6)* (either term, 3-0-3). Classification of soils. Properties of Portland cement concrete related to micro- and macro-structure and constituent materials. Properties of bituminous materials and design of bituminous mixes. Prerequisite: MATE 252 or ENV E 220.

CIV E 395 Civil Engineering Analysis III
★3.5 *(fi 6)* (either term, 3-0-2/2). The formulation of partial differential equations for modeling civil engineering problems. Introduction to analytical and numerical solution techniques. Prerequisites: MATH 201 and CIV E 295.

CIV E 398 Introduction to Continuum Mechanics
★3.5 *(fi 6)* (first term, 3-1s-0). Stress, strain and displacements in two and three dimensions. Constitutive equations. Governing equations of elasticity and simple solutions. Strain energy and virtual work. Theories of failure. Prerequisites: CIV E 270 and MATH 209.

CIV E 404 Construction Methods
★3.8 *(fi 6)* (either term, 3-0-3/2). Principles of building, heavy and bridge construction; wood and formwork design, stability during construction, economics of equipment selection, movement of material on construction sites, safety, and constructability issues. Prerequisite: CIV E 372.

CIV E 406 Construction Estimating, Planning, and Control
★3.8 *(fi 6)* (either term, 3-0-3/2). Introduction to elements of construction, planning, scheduling, and cost estimating. Familiarization with quantity take-off, estimate preparation, cost recovery, resource allocation, project scheduling, risk analysis, and bid preparation. Prerequisite: CIV E 303.

CIV E 409 Construction Methods
★4.5 *(fi 6)* (either term, 3-0-3). Principles of building, heavy and bridge construction; wood and formwork design, stability during construction, economics of equipment selection, movement of material on construction sites, safety, and constructability issues. Students work in teams on a design project. Prerequisites: CIV E 303 and 372.

CIV E 421 Processes for Public Health and Environmental Protection
★3.8 *(fi 6)* (either term, 3-0-3/2). Theory of chemical, physical and biological processes in environmental engineering. Chemical kinetics and equilibrium, biological growth and kinetics, elements of reactor design, sedimentation, filtration, absorption; precipitation and gas transfer, introduction to facility design. Prerequisite: CIV E 221.

CIV E 429 Environmental Engineering Design
★4.5 *(fi 6)* (second term, 3-0-3). Fundamentals of municipal design, planning and environmental impact assessment; detailed design and assessment projects; reports; presentation; field trips. Students work in teams on a design project. Prerequisites: CIV E 221, 321 and ENV E 421.

CIV E 431 Water Resources Engineering
★3.8 *(fi 6)* (either term, 3-0-3/2). Hydrotechnical analysis, including: advanced open channel hydraulics; advanced surface water hydrology; groundwater and well hydraulics; and environmental hydraulics. Prerequisites: CIV E 321, 331. Credit cannot be obtained in this course if credit has already been obtained in CIV E 433.

CIV E 433 Hydrology
★3.8 *(fi 6)* (either term, 3-0-3/2). Introduction to concepts in hydrology and hydrogeology. Hydrology topics include precipitation, evaporation, infiltration, streamflow and hydrograph analysis. Hydrogeology topics include infiltration, percolation, seepage, drainage, aquifer hydraulics, contaminant transport and urban runoff quality. Prerequisite: CIV E 321.

CIV E 439 Water Resources Engineering Design
★4.5 *(fi 6)* (second term, 3-0-3). Design of hydraulic structures and river engineering works, including: dams, spillways, energy dissipators, bridges, culverts, erosion protection and river training works. Students work in teams on a design project. Prerequisite: CIV E 431 or both of CIV E 321 and 331.

CIV E 474 Structural Design II
★3.8 *(fi 6)* (either term, 3-0-3/2). Behavior and design of steel and reinforced concrete structures. This course builds on the material presented in CIV E 374 and places greater emphasis on the behavior of overall structures. Prerequisite: CIV E 374.

CIV E 479 Structural Design III
★4.5 *(fi 6)* (second term, 3-0-3). Design of prestressed concrete structures; masonry and reinforced masonry elements; timber structures; fatigue life of steel structures and cold formed steel elements. Students work in teams on a design project. Prerequisite: CIV E 474.

CIV E 481 Soil Engineering
★3.8 *(fi 6)* (either term, 3-0-3/2). Site investigation; strength of soils; geosynthetics for soil improvement; design of excavations and earth pressures on retaining structures; stability of natural slopes and their improvement; design of cuts and embankments; foundation design, stability and settlement; pile foundations; frost action and permafrost. Prerequisite: CIV E 381.

CIV E 489 Geotechnical Design
★4.5 *(fi 6)* (second term, 3-0-3). Evaluation of site conditions. Design and analysis of shallow and deep foundations and retaining structures. Slope stability of embankments and cuts including foundation excavations. Students work in teams on a design project. Prerequisite: CIV E 481.

CIV E 490 Civil Engineering Report Writing
★2 *(fi 6)* (either term, 1-2s-0). Written and oral communication; lectures and practice on presentation of oral and written reports. A comprehensive written report must be submitted by each student. Prerequisite: consent of Department.

CIV E 499 Special Topics in Civil Engineering Design
★4.5 *(fi 6)* (either term, 3-0-3).

CIV E 506 Construction Estimating, Planning, and Control
★3 *(fi 6)* (second term, 3-0-0). Introduction to elements of construction, planning, scheduling, and cost estimating. Familiarization with quantity take-off, estimate preparation, cost recovery, resource allocation, project scheduling, risk analysis, and bid preparation. Prerequisite: CIV E 303.

CIV E 521 Environmental Engineering Design
★3 *(fi 6)* (second term, 3-0-0). Fundamentals of municipal design, planning and environmental impact assessment; solid waste management; detailed design and assessment projects; reports; presentations; field trips. Prerequisites: CIV E 221, 321, and 421.

CIV E 540 Hydraulic Engineering
★3 *(fi 6)* (second term, 3-0-0). Theory and design of hydraulic structures like dams, spillways, energy dissipators, drop structures, weirs, and culverts. Elementary river engineering including backwater curve computations. Hydraulic transients. Prerequisite: CIV E 331.

CIV E 574 Structural Design III
★3 *(fi 6)* (second term, 3-0-0). Design of prestressed concrete structures; masonry and reinforced masonry elements; timber structures; fatigue life of steel structures and cold formed steel elements. Prerequisites: CIV E 374 and 474.

CIV E 591 Geotechnical Design
★3 *(fi 6)* (second term, 3-0-0). Evaluation of site conditions. Design and analysis of shallow and deep foundations and retaining structures. Slope stability of embankments and cuts including foundation excavations. Prerequisite: CIV E 481.

Graduate Courses

CIV E 601 Project Management
★3 *(fi 6)* (either term, 3-0-0). Overview of project management for capital construction projects. Emphasis on planning and scheduling, including linear scheduling, project control, value engineering, and constructability.

CIV E 602 Contract Administration
★3 *(fi 6)* (either term, 3-0-0). Construction project and contract administration; budgeting, costing and financial project control; delivery systems; labour relations; safety.

CIV E 603 Computer Applications and Information Management in Construction
★4.5 *(fi 6)* (either term, 3-0-3). Computer-aided information management in construction, including relational database development and management, application of artificial neural networks, and application of computers in the planning, organization and control of construction projects.

CIV E 604 Construction Law
★3 *(fi 6)* (either term, 3-0-0). Covers fundamentals of construction law; overview of the Canadian Legal System, business organization. Tort liability, construction contracts, agreements. Lien legislation, statutes governing the engineering profession and other legal topics.

CIV E 605 Decision Support Systems in Construction
★3 *(fi 6)* (either term, 3-0-0). Development of decision support systems for construction project planning and control. Explores techniques of automated data acquisition, expert systems, utility theory, multi-attribute decision-making and fuzzy logic. Development of practical applications in construction.

CIV E 606 Design and Analysis of Construction Operations
★3 *(fi 6)* (either term, 3-0-0). Overview of production management in construction. Techniques for modeling construction operations, design of efficient processes, measurement and improvement of productivity. Computer simulation techniques for modeling and analysis.

CIV E 608 Construction Engineering
★3.8 *(fi 6)* (either term, 3-0-3/2). Introduction to the elements and methods of construction and principles of material handling on construction projects. Winter construction, dewatering, earthmoving and earthworks, concrete processes, building systems and lifting. Site tours.

CIV E 611 Pavement Materials
★3 *(fi 6)* (either term, 3-0-0). Source, manufacture, properties, tests and specifications of bituminous materials; properties and testing of aggregate, bituminous and stabilized mixtures; construction and quality control.

CIV E 618 Pavement Management Systems
★3 *(fi 6)* (either term, 3-0-0). Introduction to pavement management, network and project level management, data collection and management, pavement evaluation, pavement design, rehabilitation and maintenance, pavement performance models, life cycle analysis, implementation of pavement management systems, future directions and research needs.

CIV E 619 Advanced Project Planning and Control
★3 *(fi 6)* (either term, 3-0-0). Advanced techniques used for project planning and control, with an emphasis on scheduling of repetitive (linear) construction operations. Current research and computer applications will be used to demonstrate these techniques.

CIV E 620 Environmental Engineering Measurements I
★4.5 *(fi 6)* (either term, 3-0-3). Theory and procedures for determining the quality of natural water, potable water, municipal and industrial wastes. Fundamental parameters and concepts for environmental quality evaluation.

CIV E 621 Municipal Distribution and Collection Systems
★3 *(fi 6)* (either term, 3-0-0). Detailed and advanced design of water supply systems, sewerage and storm drains. Rates of flow, and hydraulics of networks and sewers, rainfall-runoff analysis, storm water storage, loads on conduits are examined. Solid waste collection and processing systems.

CIV E 622 Physical/Chemical Water and Wastewater Treatment
★3 *(fi 6)* (either term, 3-0-0). Theory and design of chemical and physical unit processes utilized in the treatment of water and wastewater, sedimentation, flotation, coagulation, precipitation, filtration, disinfection, ion exchange, reverse osmosis, adsorption, and gas transfer.

CIV E 623 Industrial Water and Wastewater Management
★3 *(fi 6)* (either term, 3-0-0). Industrial water quantity and quality requirements. Characteristics of wastes, inplant controls, product recovery; effluent characteristics, chemical and toxic properties, pretreatment and treatment design theory and methodology, water reclamation and reuse regulations.

CIV E 624 Biological Waste Treatment Processes
★3 *(fi 6)* (either term, 3-0-0). Study of the theoretical and applied aspects of wastewater treatment by activated sludge, fixed and moving biological films, conventional and aerated lagoons, sludge digestion, septic tanks, land treatment, and nutrient removal. Guidelines, regulations and economics. System analysis and design of facilities.

CIV E 625 Engineering Management of Water Quality
★3 *(fi 6)* (either term, 3-0-0). Concepts, rationale, theory, institutions and engineering aspects of water quality management. Methods of water quality management; oxygen; chemical and microbial models, natural and induced re-aeration techniques; thermal pollution and ice cover considerations.

CIV E 626 Environmental Health Engineering
★3 *(fi 6)* (either term, 3-0-0). Exposure assessment including environmental partitioning behavior of contaminants, and human exposure measurement, modelling and time-activity analysis. Health assessment including hazard identification, dose-response assessment, odour and noise assessment. Risk management.

CIV E 627 Environmental Engineering Measurements II
★3 *(fi 6)* (either term, 1-0-4). Laboratory experiments to present techniques for obtaining data and relationships needed for design of treatment facilities. Analytical approaches, data interpretation, presentation and design methods. Applications of experimental design principles.

CIV E 628 Municipal Solid Waste Management
★3 *(fi 6)* (either term, 3-0-0). Principles of municipal waste management to protect public health, municipal waste streams, waste stream analysis and prediction. Refuse collection, storage and hauling methods, and facilities. Engineering design and operation of solid waste processing, treatment and disposal methods: resource recovery, recycling programs, incineration, composting, landfilling, and novel techniques. Solid waste legislation and policies. Environment impacts, impact management and facility siting of waste facilities.

CIV E 631 Engineering Fluid Mechanics
★3.5 *(fi 6)* (either term, 3-0-1). Navier-Stokes equations and viscous flow. Turbulence and Reynolds equations. Potential flow. Boundary layers. Flow around bodies. Jets and wakes. Related Lab experiments.

CIV E 632 Hydraulic Structures
★3.5 *(fi 6)* (either term, 3-0-1). Hydraulic design of water-handling structures used for extraction, retention, conveyance, control, regulation, energy dissipation, drainage, navigation, flood controls and other civil engineering schemes. Related Lab experiments.

CIV E 634 Numerical Methods in Hydraulics
★3 *(fi 6)* (either term, 3-0-0). Review of numerical methods for solution of linear and nonlinear systems of algebraic and ordinary differential equations. Finite difference, finite volume and finite element methods for partial differential equations with an emphasis on convection dominated transport equation problems. Stability and accuracy analysis of numerical methods.

CIV E 635 Advanced Environmental Fluid Mechanics
★3.5 *(fi 6)* (either term, 3-0-1). Mixing processes and pollutant transport in rivers, lakes, estuaries, coastal waters, and the atmosphere. Prerequisite: CIV E 631. Related Lab experiments.

CIV E 636 Ice Engineering
★3.5 *(fi 6)* (either term, 3-0-1). Elementary heat transfer analysis. Ice formation processes. Ice hydraulics. Ice mechanics. Interaction of ice and engineering structures.

CIV E 638 Experimental Fluid Mechanics
★3.5 *(fi 6)* (either term, 3-0-1). Methods used for the measurement and analysis of data in fluid mechanics experiments. Topics covered will include: dimensional analysis and similitude; digital data acquisition, digital signal processing, spectral analysis, error analysis, surface wave height and slope measurements; laser-Doppler velocimetry, acoustic-Doppler velocimetry, particle-image velocimetry, high speed video and flow visualization.

CIV E 639 Computational Hydraulics
★3 *(fi 6)* (either term, 3-0-1). Application of computational methods to problems in Hydraulic Engineering, including: transient pipe and open channel flow, two-dimensional shallow water flow, and contaminant and sediment transport. Introduction to computational fluid dynamics. Recommended Prerequisite: CIV E 634 or consent of the instructor.

CIV E 640 River Engineering
★3.5 *(fi 6)* (either term, 3-0-1). Flow and sediment transport in alluvial channels; engineering geomorphology; river ecology; design of river engineering installations.

CIV E 641 Advanced Surface Water Hydrology
★3 *(fi 6)* (either term, 3-0-0). Precipitation, evaporation, infiltration. Streamflow and hydrograph analysis. Hydrologic systems. Hydrologic routing. Simulation models. Statistical methods.

CIV E 644 Stochastic Processes of Hydrology
★3.5 *(fi 6)* (either term, 3-0-1). Probability distributions of random phenomena, parameter estimates and applications in hydrology. Analysis and modelling of hydrologic time series using Autoregressive Moving-Avenue (ARMA) models. Spatial interpolation schemes of hydrologic data. Introduction to chaotic processes, concepts of scale, self-similarity and fractal dimensions. This course is complementary to CIV E 641, which deals with the physical aspects of hydrologic processes.

CIV E 645 Water Resources Planning and Management
★3.5 *(fi 6)* (either term, 3-0-1). Systems concept on the planning and management of water resources systems. Engineering economics and economic theories. Evaluate and optimize the design and operations of water resources systems using Linear Programming, chance-constrained Linear Programming, Dynamic Programming, Stochastic Dynamic Programming, constrained and unconstrained nonlinear programming. Optimal sizing and operations of reservoir systems and hydropower using HEC5 and urban stormwater management system.

CIV E 650 Advanced Topics in Photogrammetry
★3 *(fi 6)* (either term, 3-0-0). Specialized photogrammetric techniques for use in engineering and scientific measurements. Emphasis on close-range and terrestrial photogrammetry, self-calibration modeling and special adjustment techniques.

CIV E 651 Advanced Topics in Surveying
★3 *(fi 6)* (either term, 3-0-0). Study of modern survey techniques and their application. Emphasis on modern positioning systems, deformation monitoring, survey design and data analysis.

CIV E 652 Advanced Topics in Data Analysis and Adjustment
★3 *(fi 6)* (either term, 3-0-0). Study of data analysis techniques. Regression and adjustment procedures for photogrammetric, surveying and engineering applications.

CIV E 654 Artificial Intelligence and Automation in Construction
★3 *(fi 6)* (either term, 3-0-0). Prototyping techniques applied to the design and development of systems based on artificial intelligence techniques for use in construction.

CIV E 656 Environmental Engineering Assessment and Management
★3 *(fi 6)* (either term, 3-0-0). Review of EIA basics: definitions, cause-effect mechanisms, description of engineered activities and baselines, environmental impact predications, testing and monitoring of effects, project evaluation and decision making for engineering design, and impact management of engineered facilities. Environmental management plans and audits, communication with stakeholders, and review of projects. Prerequisites: CIV E 620 and 622.

CIV E 658 Design of Civil Engineering Experiments
★3 *(fi 6)* (either term, 3-0-0). Introduction to experimental design; design of experiments in environmental, transportation, and other civil engineering specialty areas; analysis of experimental and survey data.

CIV E 660 Advanced Structural Analysis
★3 *(fi 6)* (either term, 3-0-0). Direct stiffness theory and modeling of three dimensional framed structures. Linear and nonlinear stability concepts. Approximate and Direct stiffness formulation of geometric nonlinear problems.

CIV E 661 Dynamics of Structures
★3 *(fi 6)* (either term, 3-0-0). Dynamics of single and multiple degree of freedom systems. Time step methods. Modal and response spectrum analysis for earthquake loading. Random vibration analysis. Dynamic wind loading analysis. Dynamics of foundations.

CIV E 664 Introduction to Solid Mechanics
★3 *(fi 6)* (either term, 3-0-0). Formulation of basic equations of elasticity in solid mechanics. Cartesian tensor notation. Variational principles.

CIV E 665 Introduction to the Finite Element Method
★3 *(fi 6)* (either term, 3-0-0). Fundamentals of the formulation and application of the finite element method to problems of continuum mechanics, with special reference to civil engineering, including problems in solid mechanics and soil mechanics. Prerequisite: CIV E 664 or consent of Instructor.

CIV E 666 Structural Concepts
★4 *(fi 6)* (either term, 3-1s-1). Causes and characteristics of loads on buildings, bridges and other structures. Reasons for and calculations of load and resistance factors.

CIV E 670 Behavior and Design of Steel Members
★4 *(fi 6)* (either term, 3-1s-1). Material properties and plate-buckling problems. Behavior and design of steel tension and compression members, beams and beam-columns. Behavior and design of welded and bolted connections. This course is designed to give the student an understanding of the individual members which form the steel structure.

CIV E 671 Behavior and Design of Steel Structures
★3 *(fi 6)* (either term, 3-0-0). Brittle fracture and fatigue problems. Behavior and design of composite beams and plate girders. Discussion of frame behavior; overall buckling and instability concepts as related to the design of columns and bracing systems. This course is designed to build on the material contained in CIV E 670 and to give the student an insight into the behavior of the total structure.

CIV E 672 Behavior and Design of Concrete Members
★4 *(fi 6)* (either term, 3-1s-1). Strength and behavior of simple reinforced concrete members. Relation between results of research and current design specifications. Material properties. Members subjected to flexure, axial compression, combined flexure and axial load, combined flexure and shear, torsion.

CIV E 673 Behavior and Design of Concrete Structures
★3 *(fi 6)* (either term, 3-0-0). Strength and behavior of statically indeterminate reinforced concrete structures. Elastic and limit analysis and design considerations for continuous slab systems, frames and shear walls.

CIV E 674 Behavior and Design of Prestressed Concrete Structures
★3 *(fi 6)* (either term, 3-0-0). (Offered alternate years.) Principles and methods of prestressing. Service load design and analysis. Behavior and strength design. Losses in prestress and anchorage zone stresses. Continuous beams and slabs. Discussion of design specifications.

CIV E 676 Behavior and Design of Masonry Structures
★3 *(fi 6)* (either term, 3-0-0). (Offered alternate years.) Historical developments. Masonry units, mortars and grouts. Behavior, strength and stability of masonry under axial compression. Reinforced masonry in bending and combined axial load and bending. Ductility and joint control. Design application including discussion of code requirements.

CIV E 680 Engineering Properties of Soils
★4 *(fi 6)* (first term, 3-1s-1). Principle of effective stress, clay-water systems, soil compressibility and theories of consolidation. Pore pressure parameters. Strength of granular and cohesive media. Anisotropy of soils. Laboratory measurement of strength and deformation properties. Stress-strain relations.

CIV E 681 Seepage and Drainage
★4 *(fi 6)* (first term, 3-1s-1). Elements of hydrogeology; regional groundwater flow, borehole logging methods. Theory of groundwater flow through soils and rocks, permeability, Darcy's law, field governing equations and their solution by approximate methods, finite difference and finite element methods, unsaturated flow. Civil engineering applications, seepage in earth structures, design of dewatering systems for excavations and slopes, field testing, grouting.

CIV E 682 Environmental Geotechnics
★3.5 *(fi 6)* (either term, 3-0-1). Environmental laws and regulatory processes; geotechnical characterization for environmental problems; transfer processes; elements of groundwater contaminants, geotechnical aspects of waste management; mine waste; dumps and tailings dams; design of landfills; in-situ characterization; site remediations; geotechnical aspects of nuclear waste storage.

CIV E 683 Site Investigation Practice
★3 *(fi 6)* (first term, 3-0-0). Techniques of site investigation for geotechnical engineering, in situ testing, instrumentation for field performance studies, case histories covering both rock and soil applications.

CIV E 684 Engineering Geology and Terrain Analysis
★4 *(fi 6)* (second term, 3-1s-1). Information sources in engineering geology and terrain analysis, elements of the geology of sediments and glacial geology. Glacial and periglacial land forms. Photogeology and airphoto interpretation applied to geotechnical engineering. Case histories based on specific materials and regional problems.

CIV E 685 Applied Environmental Geochemistry
★4.5 *(fi 6)* (either term, 3-0-3). Geochemical processes in groundwater and mineral-water-atmosphere interaction related to petroleum, mining and agricultural wastes. Develop concepts in thermodynamic equilibrium chemistry, carbonate and nitrogen chemistry, sorption and exchange reactions, oxidation-reduction reactions and iron-sulphur geochemistry. Computation methods in geochemical modeling (PHREEQC), speciation prediction, reaction path modeling, groundwater mixing and reactive transport analysis. Techniques in environmental soil, groundwater, surface water sampling and field screening methods. Introduction to analytical testing methods for organic and inorganic chemicals and the assessment and interpretation of analytical testing results. Prerequisites: University level basic chemistry course, introductory computer course and introductory geology/mineralogy course.

CIV E 687 Rock Engineering for Near Surface Structures
★3 *(fi 6)* (second term, 3-0-0). Deterministic and probabilistic design methods for rock slopes and foundations on rocks. Economic, operational and geological factors affecting design. Support and stabilization techniques, excavation methods, monitoring structures in and on rock, foundations for dams and for large loads.

CIV E 690 Advanced Foundation Engineering
★4 *(fi 6)* (either term, 3-1s-1). Theories of lateral pressures. Limit equilibrium methods, elasticity methods, semi-empirical methods. Soil anchors. Design of retaining walls and strutted excavations. Bearing capacity of shallow and deep foundations. Allowable settlement of structures. Analysis of settlement of shallow and deep foundations. Behavior of pile groups. Design problems in foundation engineering.

CIV E 692 Tunnelling
★3.5 *(fi 6)* (second term, 3-1s-0). Methods of tunnelling, including excavation methods and support techniques, ground response, in situ and induced stress field, displacement field around deep and near surface tunnels, ground-support interaction, design criteria for tunnels in soil and rock, shaft design, site investigation practice and monitoring of tunnels.

CIV E 694 Permafrost Engineering
★3 *(fi 6)* (either term, 3-0-0). Implications for northern development, extent, engineering classification, thermal regime, ground ice, genesis, site investigations, heat conduction in the ground, properties of frozen soil, thaw consolidation, freezing mechanisms, foundations in frozen ground; slope stability, highways and airfields, pipelines and earth dams in arctic and sub-arctic regions. Prerequisite: CIV E 481 or consent of Department.

CIV E 695 Soil Structures
★4 *(fi 6)* (second term, 3-1s-1). Stresses in slopes. Limit equilibrium methods of analysis. Landslides in soil. Design of earth dams and embankments. Case histories of earth and rockfill dams. Dam foundations. Soft ground tunnelling.

CIV E 697 Rock Engineering
★4 *(fi 6)* (first term, 3-1s-1). Elements of structural geology, analysis of the geometry of rock defects, properties of intact rocks. Properties of rock masses

and stresses in rock masses, stability of rock slopes. Rock foundations and underground excavations in rock. Case studies.

CIV E 698 Petroleum Geomechanics
★3 *(fi 6)* (either term, 3-0-0). Application geotechnical engineering principles to petroleum engineering problems. Principles of thermo-poroelasticity are reviewed. Borehole stability, hydraulic fracturing, subsidence/heave, sand production, formation damage and reservoir-geomechanical modelling are the major topics for the course. Special attention is given to geomechanical influences on reservoir flow processes. Prerequisite: consent of Instructor.

CIV E 699 Numerical Methods in Geotechnical Engineering
★3 *(fi 6)* (either term, 3-0-0). Techniques and procedures in geotechnical analysis. Geotechnical analysis using commercial computer packages. Nonlinear (material and geometric) finite element methods, advanced constitutive modeling for geotechnical materials, mixed, hybrid and weighted residual formulations, coupled flow/deformation finite element formulation, finite difference and boundary element methods. Other special topics include fracture/shear bank modeling, rock joint modeling and discrete element modeling. Prerequisite: CIV E 664 and CIV E 665 or permission of Instructor.

CIV E 709 Advanced Topics in Construction Engineering and Management
★3 *(fi 6)* (either term, 3-0-0).

CIV E 719 Advanced Topics in Transportation and Highway Engineering
★3 *(fi 6)* (either term, 3-0-0).

CIV E 729 Advanced Topics in Environmental Engineering
★3 *(fi 6)* (either term, 3-0-0).

CIV E 739 Advanced Topics in Fluid Mechanics and Hydraulics
★3 *(fi 6)* (either term, 3-0-0).

CIV E 749 Advanced Topics in Water Resources Engineering
★3.5 *(fi 6)* (either term, 3-0-1). Related Lab experiments.

CIV E 779 Advanced Topics in Structural Engineering
★3 *(fi 6)* (either term, 3-0-0).

CIV E 799 Advanced Topics in Soil Mechanics
★3 *(fi 6)* (either term, 3-0-0).

CIV E 900 Directed Research Project
★3 *(fi 6)* (variable, unassigned).

221.42 Classics, CLASS

Department of History and Classics
Faculty of Arts

Notes
(1) None of the courses under this heading will fulfil the language-other-than-English requirement of the BA degree.
(2) Courses under this heading from 100-400 level may be taken by students with no knowledge of Greek or Latin. Knowledge of Greek or Latin may be required at the 500-level.
(3) The 100-level courses provide the broadest introduction to Classics, while the 200-level courses are overviews of specific areas within Classics. The 300-level courses build upon the 200-level courses and have suitable pre-requisites. Note:Some 300-level courses do not have a specific topic and the details of the topic to be offered in any given year can be obtained from the Department.
(4) All 400-level courses under this heading have a pre-requisite of at least one senior level Classics, Greek, or Latin course.
(5) The courses numbered 460 through the 500-level are designed for fourth-year Honors, and graduate students. Because precise topics in any given course may vary from year to year, students' interests are taken into account. For additional related courses see Greek and Latin listings.

Undergraduate Courses

L CLASS 102 Greek and Roman Mythology
★3 *(fi 6)* (either term, 3-0-0). A survey of classical mythology with readings in translation from various ancient authors as well as from modern scholarly works. Formerly CLASS 202.

CLASS 103 Introduction to Ancient Greece
★3 *(fi 6)* (either term, 3-0-0). Formerly CLASS 270.

CLASS 104 Introduction to Ancient Rome
★3 *(fi 6)* (either term, 3-0-0). Formerly CLASS 271.

L CLASS 110 The Ancient World
★3 *(fi 6)* (either term, 3-0-0). World history from the beginning of written records down to the sixth century AD. The course covers the ancient history of the Mediterranean world, with particular emphasis on Egypt, Greece and Rome and compares developments in civilization in these areas with those in Persia, India, China and Japan. Note: Students choosing CLASS 110 for partial fulfilment of the Humanities Group A requirement must also take one of HIST 110, 111 or 112. Formerly CLASS 210.

O CLASS 221 Literature of Greece and Rome
★3 *(fi 6)* (either term, 3-0-0). An introductory survey in English translation of major works from Greek and Latin literature. This will include epic, lyric, and drama. Formerly CLASS 201. May not be taken concurrently with or subsequent to CLASS 321/322.

CLASS 254 Introduction to Greek Art and Archaeology
★3 *(fi 6)* (either term, 3-0-0). Survey of the art, artifacts, and monuments of the Ancient Greek World. Formerly CLASS 252.

CLASS 255 Introduction to Roman Art and Archaeology
★3 *(fi 6)* (either term, 3-0-0). Survey of the art, artifacts, and monuments of the Ancient Roman World. Formerly CLASS 252.

L CLASS 261 Women in the Ancient World
★3 *(fi 6)* (either term, 3-0-0). An introduction to the role of women in the Ancient World as approached through the study of literature, law, religion, and art. Formerly CLASS 361.

CLASS 280 Introduction to Ancient Greek History
★3 *(fi 6)* (either term, 3-0-0). Not open to students with credit in any two of CLASS 371, 372, and 373.

CLASS 281 Introduction to Roman History
★3 *(fi 6)* (either term, 3-0-0). Not open to students with credit in any two of CLASS 365, 366, 378 and 379.

L CLASS 294 Ancient Science, Technology, and Medicine
★3 *(fi 6)* (either term, 3-0-0). An introduction to the development of science, technology, and medicine in the ancient world with particular reference to the civilizations of Greece and Rome. Not available for those who have successfully completed CLASS 141.

O CLASS 302 Classical Myth and Religion
★3 *(fi 6)* (either term, 3-0-0). The background and origin of classical mythology and religion; Mycenean and Near Eastern sources; religious festivals and usages; modern scholarship. Formerly CLASS 357. Prerequisite: CLASS 102 or consent of Department.

CLASS 303 Religion in Greco-Roman Antiquity
★3 *(fi 6)* (either term, 3-0-0). Examination of the nature of pre-Christian religious practices in antiquity.

O CLASS 321 Greek Literature in Translation
★3 *(fi 6)* (either term, 3-0-0). A study of representative works of Greek literature. Formerly CLASS 349/359. Prerequisite: CLASS 102, 221 or consent of Department.

O CLASS 322 Latin Literature in Translation
★3 *(fi 6)* (either term, 3-0-0). A study of representative works of Latin literature. Formerly CLASS 351. Prerequisite: CLASS 102, 221 or consent of Department.

CLASS 354 Topics in Greek Civilization
★3 *(fi 6)* (either term, 3-0-0). Examination of one aspect of the Classical Greek World. (Emphasis in any one year may be archaeological, historical or literary). Prerequisites: CLASS 254 or 280.

CLASS 355 Topics in Roman Civilization
★3 *(fi 6)* (either term, 3-0-0). Examination of one aspect of the Classical Roman World. (Emphasis in any one year may be archaeological, historical or literary). Prerequisites: CLASS 255 or 281.

CLASS 356 Topics in Ancient Art
★3 *(fi 6)* (either term, 3-0-0). Examination of one aspect of art in the Greco-Roman world. Prerequisites: CLASS 254 or 255.

CLASS 358 Topics in the Methodology, Theory and Practice of Classical Archaeology
★3 *(fi 6)* (either term, 3-0-0). Prerequisites: CLASS 254 or 255.

CLASS 360 Ancient Historiography
★3 *(fi 6)* (either term, 3-0-0). Examination of the development of history writing in Classical Antiquity. Prerequisite: CLASS 280 or 281.

O CLASS 375 History of Medicine in the Ancient World
★3 *(fi 6)* (either term, 3-0-0). A survey of medical science from Prehistoric times through Egyptian, Mesopotamian, Greek, and Roman times to the end of the Roman Empire. Normally offered in Spring/Summer.

O CLASS 376 Early Civilization I
★3 *(fi 6)* (either term, 3-0-0). A survey of the beginnings and development of civilization in the Near East, including Sumer, Babylon, Assyria, and the Hebrews. Formerly CLASS 369.

O CLASS 380 History of Palestine
★3 *(fi 6)* (either term, 3-0-3). From the Persian Conquest to the time of Jesus.

O CLASS 387 Pre-Islamic North Africa
★3 *(fi 6)* (either term, 3-0-0). The history of North Africa from the 1st millennium

BC to the eve of the Arab conquest. Topics will include the first Phoenician and Greek settlements, Punic civilization, Roman and Vandal occupation and the Byzantine reconquest.

CLASS 391 Introduction to Classical Field Archaeology
★3-6 *(variable)* (variable, 0-10L-0). Not open to students with credit in CLASS 475 or 476. Note: Offered only for fieldwork in the archaeology of the Greek and Roman world and restricted to those participating in a fieldwork program sponsored by the Department.

O CLASS 399 Topics in the Ancient World
★3 *(fi 6)* (either term, 3-0-0).

L CLASS 463 Topics in Roman Republican History
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: CLASS 281 or consent of Department.

L CLASS 473 Topics in Classical Archaeology
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: Any one of CLASS 354, 355, 356, 358 or consent of Department.

L CLASS 474 Pre-Roman Italy
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: Any one of CLASS 254, 255, 280, 281 or consent of Department.

L CLASS 475 Techniques of Classical Field Archaeology
★3-6 *(variable)* (variable, 0-10L-0). The techniques of survey, excavation and recording in Classical Archaeology. Prerequisites: Students must be either Classics majors or in a Classics graduate program. Note: Offered only for fieldwork in the archaeology of the Greek and Roman world and restricted to those participating in a fieldwork program sponsored by the Department.

L CLASS 476 Advanced Field Techniques in Classical Archaeology
★3-6 *(variable)* (variable, 0-10L-0). Advanced field application of Classical Archaeological Theory. Prerequisites: CLASS 475 or equivalent. Note: Offered only for fieldwork in the archaeology of the Greek and Roman world and restricted to those participating in a fieldwork program sponsored by the Department.

L CLASS 478 Topics in Roman Art
★3 *(fi 6)* (either term, 0-3s-0). In-depth study of aspects of Roman art. Prerequisite: CLASS 355 or 356 or consent of Department

L CLASS 479 Topics in Roman Archaeology and Social History
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: CLASS 281 or 355 or consent of Department.

L CLASS 480 Topics in the Archaeology of the Roman Provinces
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: CLASS 281 or 355 or consent of Department.

CLASS 481 Topics in Greek History
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: CLASS 280 or consent of Department.

L CLASS 498 Individual Study of Literary Problems
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: Any one of CLASS 221, 261, 321, 322, or consent of Department.

L CLASS 499 Individual Study of Historical and Archaeological Problems
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

CLASS 500 Fourth-Year Honors Tutorial
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

Graduate Courses

CLASS 501 Research Methods and Resources in Classics
★1 *(fi 2)* (first term, 0-1s-0).

CLASS 515 Topics in the Archaeology of Greece
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

CLASS 516 Topics in the Archaeology of the Roman Provinces
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

CLASS 522 Studies in Ancient History
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

CLASS 574 Pre-Roman Italy
★3 *(fi 6)* (either term, 0-3s-0). The native cultures of the Italian peninsula from the beginning of the first millennium BCE to the end of the Samnitic wars. Formerly CLASS 511. Prerequisites: Consent of Department.

CLASS 578 Roman Art
★3 *(fi 6)* (either term, 0-3s-0).

CLASS 579 Topics in Roman Archaeology and Social History
★3 *(fi 6)* (either term, 0-3s-0).

CLASS 601 Studies in Classical Archaeology I
★3 *(fi 6)* (either term, 0-3s-0).

CLASS 602 Studies in Classical Archaeology II
★3 *(fi 6)* (either term, 0-3s-0).

CLASS 900 Directed Research Project
★3 *(fi 6)* (variable, unassigned).

221.43 Community Service Learning, CSL

Office of Interdisciplinary Studies
Faculty of Arts

Undergraduate Courses

CSL 300 Communities, Universities and Knowledge
★3 *(fi 6)* (either term, 3-0-0). An in-depth exploration of theories and practices of civic engagement and community change for Arts students who have already completed a Community Service-Learning course and wish to extend their volunteer experience for at least one more term.

221.44 Comparative Literature, C LIT

Office of Interdisciplinary Studies
Faculty of Arts

Note: Courses in Comparative Literature teach a number of literatures from an international perspective with the help of translations as necessary.

Undergraduate Courses

O C LIT 100 World Literature
★6 *(fi 12)* (two term, 3-0-0). An introduction to major works of the world's literary heritage, presented in their historical, social, and cultural contexts. This course is designed to acquaint students with literature as an expression of human experience and to provide a foundation for senior courses in literature, and studies in the humanities and social sciences.

O C LIT 171 Introduction to the Comparative Study of the Canadian Literatures I
★3 *(fi 6)* (first term, 3-0-0). An introductory course designed to compare the basic texts of English-Canadian and French-Canadian literatures until the 1950s.

O C LIT 172 Introduction to the Comparative Study of the Canadian Literatures II
★3 *(fi 6)* (second term, 3-0-0). An introductory course designed to compare the basic texts of English-Canadian and French-Canadian literatures since the 1950s.

O C LIT 201 Literature of the European Tradition I
★3 *(fi 6)* (either term, 3-0-0). A survey of European literary tradition from the Biblical and Graeco-Roman heritage to the Renaissance.

O C LIT 202 Literature of the European Tradition II
★3 *(fi 6)* (either term, 3-0-0). A survey of the Western literary tradition from the Renaissance to the present day.

O C LIT 206 Introduction to Literary Theory I
★3 *(fi 6)* (either term, 3-0-0). Key issues in the comparative study of literature (e.g., the nature of literature, basic text types, genres, literary history, text and reader, international literary relations). Note: Not open to students with credit in ENGL 216.

O C LIT 207 Introduction to Literary Theory II
★3 *(fi 6)* (either term, 3-0-0). Major contemporary theoretical schools, including deconstruction, poststructuralism, reader response, hermeneutics, feminism, queer theory, Marxism, and postcolonialism. Note: Not open to students with credit in C LIT 205 or ENGL 216.

O C LIT 228 Introduction to Comparative Studies in Popular Literature and Culture
★3 *(fi 6)* (either term, 3-0-0). Poetics of such popular genres as crime fiction, spy fiction, the horror story, etc., and their relation to mainstream literature and culture. Note: Not open to students with credit in C LIT 440.

O C LIT 256 Introduction to Colonial and Post-Colonial Literature
★3 *(fi 6)* (either term, 3-0-0). Introduction to the comparative study of the modern literatures of Asia, Africa and Latin America (including the Caribbean).

O C LIT 266 Women and World Literature
★3 *(fi 6)* (either term, 3-0-0). An examination of major works of world literature by women from antiquity to the present.

O C LIT 297 Special Topics in Comparative Literature
★3 *(fi 6)* (either term, 0-3s-0).

O C LIT 338 Cross-Cultural Studies in Literature
★3 *(fi 6)* (either term, 3-0-0). Study of the complexities resulting from the interaction and interpenetration of the literatures of different cultures. Topics will vary from year to year.

O C LIT 342 Science Fiction
★3 *(fi 6)* (either term, 3-0-0). An introduction to science fiction as an international genre and a survey of works and trends.

O C LIT 343 Fairy Tales and Folk Tales
★3 *(fi 6)* (either term, 3-0-0). A survey of European fairy tales, and an introduction to critical and theoretical approaches to the folk tale in general and the fairy tale in particular.

O C LIT 344 Elements of Narrative Fiction
★3 *(fi 6)* (first term, 3-0-0). An international survey of the main features of a narrative text, with historical examples and an emphasis on theory.

O C LIT 345 Elements of Poetry
★3 *(fi 6)* (second term, 3-0-0). An international survey of the main features of a poetic text, with historical examples and an emphasis on theory.

O C LIT 346 Elements of Drama
★3 *(fi 6)* (either term, 3-0-0). An international survey of the basic components and forms of dramatic structure, with historical examples and an emphasis on theory.

O C LIT 352 Relations among Literature, the Arts, Film and the Media
★3 *(fi 6)* (either term, 3-0-0). Throughout history, literature had close relations with the other arts (such as painting and sculpture, music and theatre): more recently these relations extended to cinema television, and other media. Each year, the course will emphasize one of these relations, in an interdisciplinary perspective which stresses contacts and commonalities, but also the specific differences of art forms and the media.

O C LIT 358 Great Themes of Literature and Art
★3 *(fi 6)* (either term, 3-0-0). The international and interdisciplinary study of selected international mythical and legendary themes and motifs, such as Faust and Don Juan, their origin, and their literary and artistic developments.

O C LIT 360 Marginalized Literatures
★3 *(fi 6)* (either term, 3-0-0). An introduction to literatures of minorities and lesser known national literatures.

O C LIT 362 International Movements in Contemporary Literature
★3 *(fi 6)* (either term, 3-0-0). This course is designed to introduce the student to such topics as literature of the absurd, existential literature, and surrealism.

O C LIT 363 Latin America in Its Literature (in English Translation)
★3 *(fi 6)* (either term, 3-0-0). Relations among the literature, culture, history, and politics of Latin America, primarily in Spanish-speaking areas. Themes vary from year to year. Note: not to be taken by students with credit in LA ST 360 or SPAN 360.

O C LIT 372 Comparative Studies in Canadian Prose
★3 *(fi 6)* (either term, 3-0-0). Study of narrative and other forms of Canadian prose, chiefly French and English, examined on a comparative basis within an international framework.

O C LIT 397 Special Topics in Comparative Literature
★3 *(fi 6)* (either term, 0-3s-0).

O C LIT 440 Comparative Studies in Popular Culture
★3 *(fi 6)* (either term, 3-0-0). An international historical and typological analysis of selected topics in popular literature and media, their changing status in society and culture, as well as their interaction with canonized forms of literature and the arts.

O C LIT 444 Autobiographical Writing
★3 *(fi 6)* (either term, 3-0-0). A survey of autobiographical forms from antiquity to postmodernity and a study of theoretical problems of genre and subjectivity.

O C LIT 445 Hermeneutics
★3 *(fi 6)* (either term, 3-0-0). History and development of hermeneutics with emphasis on its relevance to the study of literary and religious texts. Note: This course is equivalent to RELIG 445.

O C LIT 448 Studies in Critical Theory
★3 *(fi 6)* (either term, 3-0-0). An advanced study of a particular critical theory. Topics may include Feminism, Marxism, Post-Colonialism.

C LIT 460 Fundamentals of Comparative Literature
★3 *(fi 6)* (either term, 3-0-3). Disciplinary issues, approaches and methodologies in Comparative Literature as they differ from those of national literatures.

O C LIT 464 Studies in Literary Genres
★3 *(fi 6)* (either term, 3-0-0). An advanced study of 'genre' (e.g., the novel) in an international and a particular historical context.

O C LIT 465 Literature and Society
★3 *(fi 6)* (either term, 3-0-0). International comparative studies of the interrelationship of literature and society.

O C LIT 466 Literature and Science
★3 *(fi 6)* (either term, 3-0-0). The relation between the literary and scientific cultures. Topics may include the Two Cultures debate, social and literary utopia, eugenics, time travel, the atom bomb, futurology, machine intelligence, Internet, and cyberspace.

O C LIT 472 Advanced Comparative Studies in Canadian Prose
★3 *(fi 6)* (either term, 3-0-0). An advanced study of narrative and other forms of prose of Canadian literatures, chiefly French and English, examined on a comparative basis with an international framework.

O C LIT 474 Studies in the Relationship of Literature and the Visual Arts
★3 *(fi 6)* (either term, 3-0-0). A cross-cultural study of the interrelations between art and literature.

C LIT 480 Directed Reading in Comparative Literature
★3-6 *(variable)* (variable, 3-0-0). Prerequisite: consent of Department.

O C LIT 497 Special Topics in Comparative Literature
★3 *(fi 6)* (either term, 0-3s-0).

O C LIT 499 Honors Tutorial and Essay
★3 *(fi 6)* (either term, 0-3s-0). Preparation of the Honors Essay.

Graduate Courses

O C LIT 501 Studies in World Literature I
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 502 Studies in World Literature II
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 507 Topics in Major Contemporary Currents in Literary and Cultural Theory I
★3 *(fi 6)* (either term, 3-0-0). Variable content. Prerequisite: Reading knowledge of one relevant language other than English. Note: equivalent to EASIA 507 and MLCS 507.

O C LIT 508 Topics in Major Contemporary Currents in Literary and Cultural Theory II
★3 *(fi 6)* (either term, 3-0-0). Variable content. Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 521 Directed Reading Course I
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

O C LIT 522 Directed Reading Course II
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.

O C LIT 554 Comparative Studies in the Novel
★3-6 *(variable)* (variable, 3-0-0). Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 585 Studies of Forms and Genres
★3-6 *(variable)* (variable, 3-0-0). Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 610 Special Topics in Literary Theory and Criticism
★3-6 *(variable)* (variable, 3-0-0). Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 630 Cross-Cultural Studies in Literature
★3-6 *(variable)* (variable, 3-0-0). The focus of this course will vary from year to year. Topics may include: immigrant literature, literature of the diaspora. Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 645 Comparative Studies in 20th-Century Literature
★3-6 *(variable)* (variable, 3-0-0). Prerequisite: Reading knowledge of one relevant language other than English.

O C LIT 696 Seminar Course
★3-6 *(variable)* (variable, 0-3s-0). Prerequisite: Reading knowledge of two languages other than English.

O C LIT 697 Special Reading Course I
★3-6 *(variable)* (variable, 0-3s-0).

O C LIT 698 Special Reading Course II
★3-6 *(variable)* (variable, 0-3s-0).

C LIT 900 Directed Research Project
★3 *(fi 6)* (variable, unassigned).

221.45 Computer Engineering, CMPE

Division of Computer Engineering, Departments of Computing Science, Electrical and Computer engineering
Faculties of Engineering and Science

Undergraduate Courses

CMPE 210 Principles of Software Implementation
★4.5 *(fi 6)* (either term, 3-0-3). Guidelines for good programming style: information

hiding, coupling and cohesion, high-quality routines, modularity, usage of variables, fundamental and complex data types, conditionals, control loops, quality attributes, inspection and unit testing. Introduction to Personal Software Process (PSP) for improvement of software development on a personal level: measurement of the process performance, analysis of process measurements, adjustments and improvements of the process. Prerequisite: ENCMP 100. Corequisite: CMPUT 115.

CMPE 300 Introduction to the Software Engineering Process
★3.8 *(fi 6)* (either term, 3-0-3/2). Complexity and change in software development. Project communication, organization, and scheduling. Team dynamics. Modeling with Universal Modeling Language (UML). Software requirements. Elicitation and analysis. Object modeling. Dynamic modeling. System design. Addressing design goals. Object design. Reuse and interfaces. Software implementation. Software testing. Rationale management. Configuration management. Software life cycle. Software process improvement. Corequisite: CMPUT 201.

CMPE 310 Software Requirements Engineering
★3.5 *(fi 6)* (either term, 2-0-3). Software quality attributes. Software requirements. Requirements elicitation via interviewing, workshops, prototyping, and use case analysis. Vision document and Software Requirement Specification document standards. Formal software specification methods including operational and descriptive models. Design by contract. Verification and validation of requirements. Prerequisite: CMPE 210.

CMPE 320 Software Testing and Maintenance Engineering
★3.8 *(fi 6)* (either term, 3-0-3/2). From software requirements specification to software testing. Risk analysis and metrics for software testing. Software testing process, including test planning, design, implementation, execution, and evaluation. Test design via white box and black box approaches; coverage-based testing techniques. Unit, integration, and system testing. Acceptance tests. Software maintenance and regression testing. Prerequisite: CMPE 310.

CMPE 382 Computer Organization and Architecture
★3 *(fi 6)* (either term, 3-0-0). Survey of modern computer architecture and design concepts. Benchmarks, instruction set design and encoding. Pipelined and superscalar processors. Techniques for exposing and exploiting instruction-level parallelism. Performance of cache and virtual memory hierarchies. Input/output subsystem design. Prerequisite: E E 380 or CMPUT 229. Credit may be obtained in only one of CMPE 382 or CMPUT 429.

CMPE 401 Computer Interfacing
★3.8 *(fi 6)* (either term, 3-0-3/2). The design and use of digital interfaces, including memory, serial, parallel, synchronous and asynchronous interfaces. Hardware implementations of interrupts, buses, input/output devices. Prerequisite: E E 380 or CMPUT 229.

CMPE 402 C/C++ Programming for Engineers
★3.8 *(fi 6)* (either term, 3-0-3/2). Introduction to the C/C++ programming language and object-oriented software design. Models of software development. Fundamental principles of software engineering. Procedure-oriented versus object-oriented software design. Built-in and user-defined data types. Abstract data types and objects. Basic control structures and input/output in C/C++. Functions, parameter passing mechanisms, and function overloading. Arrays and pointers. Classes and data abstraction. Operator overloading. Class hierarchies, inheritance, virtual functions, and polymorphism. Function and class templates. Exception handling. Generic programming and the C++ Standard Template Library. Prerequisite: ENCMP 100 or equivalent. Note: Only one of the following courses may be taken for credit: CMPE 210, 402, CMPUT 201, E E 445.

CMPE 410 Exploring Software Development Domains
★3.5 *(fi 6)* (either term, 2-0-3). Advanced programming concepts. Programming language as a vehicle for discussion about programming concepts such as productivity, components and re-use, traditional vs. scripting approaches. Object-oriented construction, systems programming, concurrent programming, Graphical User Interface (GUI) programming, distributed programming, and dynamic programming. Prerequisites: CMPE 320, CMPUT 379.

CMPE 420 Reliable and Secure Systems Design
★3 *(fi 6)* (either term, 3-0-0). Causes and consequences of computer system failure. Structure of fault-tolerant computer systems. Methods for protecting software and data against computer failure. Quantification of system reliability. Introduction to formal methods for safety-critical systems. Computer and computer network security. Prerequisite: CMPE 300. Note: Only one of the following courses may be taken for credit: CMPE 420 or CMPE 510.

CMPE 440 Software Systems Design Project
★4 *(fi 6)* (either term, 1-0-6). Design of software systems from concept to working prototype. Applying software engineering techniques. Working in small groups under constraints commonly experienced in industry. Exposing each team member to the design, implementation, documentation, and testing phases of the project. Managing software development projects. Provides a capstone experience in software development processes. Prerequisite: CMPE 410.

CMPE 449 Neural Networks, Fuzzy Systems, and Genetic Optimization
★3 *(fi 6)* (either term, 3-0-0). Neural networks as adaptive systems. Main architectures and learning paradigms. Supervised, reinforcement, and unsupervised learning. Fuzzy sets. Membership functions, operations, fuzzy relations, approximate reasoning. Rule based systems, fuzzy control, pattern classification. Evolutionary computing. Genetic algorithms as mechanisms of global optimization. Neurofuzzy systems and genetic optimization of neural and fuzzy systems. Selected applications. Note: May not be taken for credit if credit has already been obtained in either E E 563 or 564.

CMPE 480 Advanced Digital Logic Design
★3.8 *(fi 6)* (either term, 3-0-3/2). Review of classical logic design methods. Introduction to the hardware description language VHDL. Logic simulation principles. Digital system design. Digital system testing and design for testability. Arithmetic circuits. State-of-the-art computer-aided design tools and FPGAs are used to design and implement logic circuits. Prerequisite: E E 351. Note: Only one of the following courses may be taken for credit: CMPE 480 or E E 480 or E E 635.

CMPE 487 Data Communications Networks
★3 *(fi 6)* (either term, 3-0-0). Network topologies. Layered architectures and the Open Systems Interconnection (OSI) reference model. Peer-to-peer protocols, medium access control protocols, and local area network standards. Packet switched networks and routing, the Internet protocol, and the Asynchronous Transport Mode (ATM) standard. Note: Only one of the following courses may be taken for credit: CMPE 487 or CMPUT 313.

CMPE 490 Design of Mircroprocessor-based Systems
★4 *(fi 6)* (either term, 1-0-6). Design of microprocessor systems, input/output systems, programmable timers, address decoding and interrupt circuitry. This course has a major laboratory component and requires the design and fabrication of a complete microprocessor-based system. Prerequisites: E E 380 or CMPUT 229, CMPE 480 or E E 480. Only one of the following courses may be taken for credit: CMPE 490 or CMPE 582 or E E 582.

CMPE 498 Special Topics in Computer Engineering
★3 *(fi 6)* (first term, 3-0-0). This course is intended to enable individuals or a small group of students to study topics in their particular field of interest under the supervision of a member of the Department of Electrical and Computer Engineering or the Department of Computing Science or other appropriate departments.

CMPE 499 Special Topics in Computer Engineering
★3 *(fi 6)* (second term, 3-0-0). This course is intended to enable individuals or a small group of students to study topics in their particular field of interest under the supervision of a member of the Department of Electrical and Computer Engineering or the Department of Computing Science, or other appropriate departments.

Graduate Courses

See listing of Electrical and Computer Engineering (ECE) graduate courses.

221.46 Computing Science, CMPUT

Department of Computing Science
Faculty of Science

Undergraduate Courses

O CMPUT 101 Introduction to Computing
★3 *(fi 6)* (either term, 3-0-3). A breadth-first introductory treatment of science and engineering concepts in computing science, including number representation, machine architecture, and operation systems: algorithms, their properties, and the control constructs of sequence, selection and repetition: notions of data type and operations on data types in low-level and high-level programming languages. See Notes (2) and (3) above.

O CMPUT 114 Introduction to Computing Science
★3 *(fi 6)* (either term, 3-0-3). An introduction to solving Computing Science problems by writing computer programs in a high-level programming language called Java. Students are introduced to objects and values, messages and methods, control structures, and simple containers. Discussion of elementary algorithms and software engineering techniques for constructing elegant and robust solutions to problems. Prerequisites: Pure Math 30 and Computing Science 30 or equivalent. See Notes (2) and (3) above.

O CMPUT 115 Programming with Data Structures
★3 *(fi 6)* (either term, 3-0-3). A study of dynamic data structures (e.g., sets, lists, stacks, queues, dictionaries) and their associated algorithms (e.g., traversal, sorting, searching, element addition and removal) using Java. An introduction to recursive references and algorithms and to more advanced programming language techniques including inheritance and exceptions. Prerequisite: CMPUT 102 or CMPUT 114 or ENCMP 100. See Notes (2) and (3) above.

CMPUT 201 Practical Programming Methodology
★3 *(fi 6)* (either term, 3-0-3). Introduction to the principles, methods, tools, and practices of the professional programmer. The lectures focus on the fundamental

principles of software engineering based on abstract data types and their implementations. The laboratories offer an intensive apprenticeship to the aspiring software developer. Students use C and C++ and software development tools of the UNIX environment. Prerequisite: CMPUT 115. Corequisite: CMPUT 272.

CMPUT 204 Algorithms I
★3 *(fi 6)* (either term, 3-1s-0). The first of two courses on algorithm design and analysis, with emphasis on fundamentals of searching, sorting, and graph algorithms. Examples include divide and conquer, dynamic programming, greedy methods, backtracking, and local search methods, together with analysis techniques to estimate program efficiency. Prerequisites: CMPUT 115, CMPUT 272; MATH 113, 114, or 117.

CMPUT 229 Computer Organization and Architecture I
★3 *(fi 6)* (either term, 3-0-3). General introduction to number representation, architecture and organization concepts of von Neumann machines, assembly level programming, exception handling, peripheral programming, floating point computations and memory management. Prerequisite: CMPUT 115. Corequisite: CMPUT 201. Credit may be obtained in only one of CMPUT 229, 285 or E E 380.

O CMPUT 272 Formal Systems and Logic in Computing Science
★3 *(fi 6)* (either term, 3-1s-1.5). An introduction to the tools of set theory, logic, and induction, and their use in the practice of reasoning about algorithms and programs. Basic set theory. The notion of a function. Counting. Propositional and predicate logic and their proof systems. Inductive definitions and proofs by induction. Program specification and correctness. Prerequisite: CMPUT 101 or 114 or equivalent. See Note 2.

CMPUT 291 Introduction to File and Database Management
★3 *(fi 6)* (either term, 3-0-3). Basic concepts in computer data organization and information processing; entity-relationship model; relational model; SQL and other relational query languages; storage architecture; physical organization of data; access methods for relational data. The programming language used in the course project is Java. Prerequisite: CMPUT 201.

CMPUT 299 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-3). Prerequisite: A 100-level CMPUT course.

CMPUT 300 Computers and Society
★3 *(fi 6)* (either term, 3-1s-0). Social, ethical, professional, economic, and legal issues in the development and deployment of computer technology in society. Prerequisites: CMPUT 201, 204. Corequisite: A 300-level CMPUT course or consent of Instructor. Note: this course is an Approved Option, in the Computing Science program, and cannot be used to satisfy a CMPUT 3xx/4xx option.

CMPUT 301 Introduction to Software Engineering
★3 *(fi 6)* (either term, 3-0-3). Object-oriented design and analysis, with interactive applications as the primary example. Topics include: software process; revision control; Unified Modeling Language (UML); requirements; software architecture, design patterns, frameworks, design guidelines; unit testing; refactoring; software tools. Prerequisite: CMPUT 201. Credit may be obtained in only one of CMPUT 301 and 311.

CMPUT 304 Algorithms II
★3 *(fi 6)* (either term, 3-0-0). The second course of a two-course sequence on algorithm design. Emphasis on principles of algorithm design. Categories of algorithms such as divide-and-conquer, greedy algorithms, dynamic programming; analysis of algorithms; limits of algorithm design; NP-completeness; heuristic algorithms. Prerequisites: CMPUT 201, 204, 229 or E E 380; STAT 221 or 265; one of MATH 225, 228, 229 or consent of Instructor.

CMPUT 306 Introduction to Image Processing
★3 *(fi 6)* (either term, 3-0-3). Introduction, history, and applications; scanning and quantization; visual perception; output devices; pattern recognition; feature extraction, decision theory, classification rules; data representation and formats; image enhancement and restoration; edge detection, segmentation and texture; correlation and registration. Prerequisites: CMPUT 201; MATH 214 and STAT 222. Credit may be obtained in only one of CMPUT 306 or EE BE 540.

CMPUT 313 Computer Networks
★3 *(fi 6)* (either term, 3-0-3). Introduction to computer communication networks. Digital transmission of data, audio and video content. The OSI reference model. Protocols for error and flow control. Medium access protocols. Routing and congestion control. Internet architecture and protocols. Recent advances in networking. Prerequisites: CMPUT 201, 204, 229 or E E 380; STAT 222.

CMPUT 320 Geometric Computing
★3 *(fi 6)* (either term, 3-0-3). An introduction to the design and implementation of geometric algorithms. Topics include: Terrains and contour lines, Delaunay triangulations and Voronoi diagrams, volume representations and rendering, winged-edge data structure and Euler operators, solid modeling and boolean operators, k-d trees and range trees. Prerequisites: CMPUT 201 and 204. May not be offered every year.

CMPUT 325 Non-Procedural Programming Languages
★3 *(fi 6)* (either term, 3-0-3). A study of the theory, run-time structure, and implementation of selected non-procedural programming languages. Languages will be selected from the domains of functional, and logic-based languages. Prerequisites: CMPUT 201, 204, 229 or E E 380, MATH 120.

CMPUT 329 Computer Organization and Architecture II
★3 *(fi 6)* (either term, 3-0-3). Digital circuits, combinational systems, memory, register transfer, control logic design, CPU design, and advanced topics on micro-architectures. Prerequisite: CMPUT 229 or E E 380. Credit may be obtained in only one of CMPUT 280, 329 or E E 280.

CMPUT 340 Introduction to Numerical Methods
★3 *(fi 6)* (either term, 3-1s-3). Computer arithmetic and errors. The study of computational methods for solving problems in linear algebra, non-linear equations, interpolation and approximation, and integration. The aim is to teach the student the proper use of mathematical subroutine packages currently available in computer libraries. Prerequisites: CMPUT 204, MATH 120, 214; STAT 222.

CMPUT 366 Intelligent Systems
★3 *(fi 6)* (either term, 3-0-3). Introduction to artificial intelligence focusing on techniques for building intelligent software systems and agents. Topics include search and problem-solving techniques, knowledge representation and reasoning, reasoning and acting under uncertainty, machine learning and neural networks. Recent applications such as planning and scheduling, diagnosis, decision support systems, and data mining. Prerequisites: CMPUT 201, 204; STAT 221 or equivalent.

CMPUT 379 Operating System Concepts
★3 *(fi 6)* (either term, 3-0-3). Definition of a process; process states and state transitions; process control block; operations on processes; interrupt processing; parallel processing; resource allocation; shared and unshared allocation; critical sections; semaphores; deadlock; deadlock prevention, avoidance, detection, and recovery; memory management; memory allocation schemes; virtual memory; paging and segmentation; page replacement strategies; working sets; demand paging; job and processor scheduling; scheduling levels, objectives, and criteria; various scheduling algorithms; multi-processor considerations; file system functions; file organization; tree structured file systems; space allocation; file catalogs; file access control mechanisms; operating systems security. Prerequisites: CMPUT 204, 229 or E E 380, CMPUT 291.

CMPUT 391 Database Management Systems
★3 *(fi 6)* (either term, 3-0-3). Logical data modeling process, relational database design (normalization), query processing, transaction management, new technological trends (distributed databases, object-orientation, knowledge base systems). Prerequisites: CMPUT 204 and 291.

CMPUT 399 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-3). Prerequisite: A 200-level CMPUT course.

CMPUT 400 Industrial Internship Practicum
★3 *(fi 6)* (first term, 0-3s-0). Required by all students who have just completed a Computing Science Industrial Internship Program. Must be completed during the first academic term following return to full-time studies. Note: A Grade of F to A+ will be determined by the student's job performance as evaluated by the employer, by the student's performance in the completion of an internship practicum report, and by the student's ability to learn from the experiences of the internship as demonstrated in an oral presentation. This course cannot be used in place of a senior-level CMPUT option or a Science option. Prerequisite: WKEXP 922.

CMPUT 401 Software Process and Product Management
★3 *(fi 6)* (either term, 3-1s-3). All phases of software development are reviewed from a process perspective. Best practices in software project and product development and management are introduced. Architectural and technological impacts on management. Group projects require specification and initial design or redesign of a software system. Prerequisites: CMPUT 301 and 379.

CMPUT 402 Software Quality
★3 *(fi 6)* (either term, 3-0-3). Software quality issues, metrics, verification, validation, and testing. Students working in project groups are required to complete the implementation of a system or significant subsystem and undertake unit, integration and acceptance testing. Industry standard assessment methods such as CMM or SPICE are introduced. Prerequisite: CMPUT 401.

CMPUT 410 Web-Based Information Systems
★3 *(fi 6)* (either term, 3-0-3). Overview of Web technologies and applications. This course is project based and addresses issues such as web-based applications and databases design and implementation, XML data exchange and modeling, application component integration over the Web, security mechanisms, and Web Mining for intelligent web-based applications. Prerequisite: CMPUT 301 and 391. CMPUT 313 recommended, or consent of Instructor based on other 300-level courses taken. May not be offered every year.

CMPUT 411 Introduction to Computer Graphics
★3 *(fi 6)* (either term, 3-0-3). 2-D and 3-D transformation; 3-D modeling and viewing; illumination models and shading methods; texture mapping; ray tracing. Prerequisites: CMPUT 204, 301 and MATH 120. Credit may be obtained in only one of CMPUT 311 and 411.

CMPUT 412 Experimental Mobile Robotics
★3 *(fi 6)* (either term, 3-0-3). A project-based course dealing with the design and implementation of behavior-based robots to accomplish specific tasks. Students

work in groups and are introduced to concepts in sensor technologies, sensor data processing, motion control, embedded system design, real-time programming, and behavior arbitration. Prerequisite: CMPUT 329 or E E 280. May not be offered every year.

CMPUT 414 Introduction to Multimedia Technology
★3 *(fi 6)* (either term, 3-0-3). Overview of multimedia. Image compression, encryption, and multimedia databases. Audio signal processing, teleconferencing, and video compression. Prerequisite: CMPUT 306 or EE BE 540 or consent of Instructor.

CMPUT 415 Compiler Design
★3 *(fi 6)* (either term, 3-0-3). Compilers, interpreters, lexical analysis, syntax analysis, syntax directed translation, code generation, code optimization. Prerequisites: CMPUT 229 or E E 380 and a 300-level Computing Science course or consent of Instructor.

CMPUT 422 Analysis of Computer Systems I
★3 *(fi 6)* (either term, 3-0-3). An introduction to measurement, simulation and analytical techniques for studying the performance of computer systems; including operating systems and communication networks. Topics include workload modeling; introduction to simulation, measurement and analysis techniques; analysis of results; data presentation. Prerequisites: CMPUT 313 or 379; STAT 222. May not be offered every year.

CMPUT 425 Object-Oriented Programming Languages
★3 *(fi 6)* (either term, 3-0-3). This course will study the computational model and runtime structure of object-oriented programming languages including objects, classes, object creation, initialization, inheritance, polymorphism, message passing, methods, binding, and dispatch. Throughout the course, the object-oriented computing model will be introduced and contrasted with the imperative model. A detailed study of Smalltalk will provide an example of a pure object-oriented programming language. Prerequisite: CMPUT 301, 325, 379. May not be offered every year.

CMPUT 429 Computer Systems and Architecture
★3 *(fi 6)* (either term, 3-0-3). An investigation of computer system design concepts including requirements, specifications, implementation and modification. Instruction sets, arithmetic/logic unit design, bus structures, I/O structures, control organization and implementation. Discussion and use of hardware description languages. Prerequisite: CMPUT 201, 229 or E E 380, STAT 222. Credit may be obtained in only one of CMPUT 429 or CMPE 382.

CMPUT 466 Machine Learning
★3 *(fi 6)* (either term, 3-0-3). Learning is essential for many real-world tasks, including adaptive control, recognition, diagnosis, forecasting and data-mining. This course will present a variety of learning algorithms (for learning decision trees, rule sets, neural networks, and belief nets), as well as general learning frameworks such as reinforcement learning and nearest neighbor approaches. It will also provide the formal foundations for understanding when learning is possible and practical. Prerequisite: CMPUT 366 or consent of Instructor. May not be offered every year.

CMPUT 474 Formal Languages, Automata, and Computability
★3 *(fi 6)* (either term, 3-0-0). Formal grammars; normal forms; relationship between grammars and automata; regular expressions; finite state machines; state minimization; pushdown automata; Turing machines; computability; the halting problem; introduction to recursive function theory. Prerequisite: CMPUT 325 and one of MATH 225, 228 or 229 or consent of Instructor.

CMPUT 495 Honors Seminar
★0 *(fi 2)* (either term, 0-1s-0). Prerequisite: A 300-level Computing Science course. Note: Required of all Honors Computing Science students during their degree program.

CMPUT 496 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: A 300-level CMPUT course.

CMPUT 497 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0). Prerequisite: A 300-level CMPUT course.

CMPUT 498 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-3). Prerequisite: A 300-level CMPUT course.

CMPUT 499 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-3). Prerequisite: A 300-level CMPUT course.

Graduate Courses

CMPUT 510 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 511 Computer Graphics
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 520 Compiler Construction
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 525 Object-Oriented Programming Languages
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 530 Computer Systems and Architecture
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 531 Robotics
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 540 Computer Networks
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 551 Artificial Intelligence
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 560 Software Engineering
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 570 Introduction to the Theory of Computation
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 580 System and Network Administration
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 581 Operating Systems
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 590 Database Management Systems
★3 *(fi 6)* (either term, 3-0-3).

CMPUT 601 Seminar
★3 *(fi 6)* (either term, 0-2s-0).

CMPUT 603 Teaching and Research Methods
★3 *(fi 6)* (first term, 2-1s-0). A description of computing science research, with emphasis on research methodology. Includes techniques and conventions that are employed in various sub-areas of computing science, both for doing research and presenting results. Strategies and information for being an effective teaching assistant are also presented. Required for all graduate students.

CMPUT 604 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 605 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 606 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 607 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 608 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 609 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 610 Topics in Computer Graphics
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 611 Advanced Computer Graphics
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 612 Virtual Reality
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 613 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 615 Topics in Image Processing and Vision
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 616 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 617 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 618 Topcis in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 620 Topics in Programming Languages
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 621 Constraint Programming
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 623 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 625 Object-Oriented Computing
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 630 Topics in Computer Architecture
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 631 Robotics
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 632 Parallel and Multiprocessor Architectures
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 633 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 640 Topics in Computer Networks
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 641 Advanced Computer Networks
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 642 Computer Network Protocols
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 643 Special Purpose Networking
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 644 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 650 Topics in Artificial Intelligence
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 651 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 652 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 654 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 655 Constraint-Based Reasoning
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 656 Logic Foundations
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 657 Heuristic Search
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 658 AI and Cognitive Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 659 Adaptive Systems
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 660 Topics in Software Engineering
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 661 Software Architecture
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 662 Software Specification and Verification
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 663 Software Process and Quality
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 664 Software Evolution
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 666 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 670 Topics in the Theory of Computation
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 671 Empirical Algorithmics
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 672 Algorithmic Graph Theory
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 673 Complexity Theory
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 674 Combinatorial Computing
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 675 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 680 Topics in Systems
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 681 Parallel Programming
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 682 Fundamentals of Distributed Systems
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 683 Performance Evaluation
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 684 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 690 Topics in Databases
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 691 Object-Oriented Databases
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 692 Modern Database Management Systems
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 693 Distributed Database Systems
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 694 Information Retrieval
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 695 Knowledge Discovery in Data
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 696 Data Management in the Internet
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 697 Topics in Computing Science
★3 *(fi 6)* (either term, 3-0-0).

CMPUT 701 Essay in Computing Science I
★6 *(fi 12)* (either term, 0-1s-5). A major essay on an agreed topic.

221.47 Curriculum et méthodologie, CU ME

Faculté Saint-Jean

Cours de 1er cycle

CU ME 308 Introduction à la didactique de la langue (élémentaire/secondaire)
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Les caractéristiques de l'approche communicative. Les caractéristiques des discours. Evolution historique de l'enseignement des langues. Les principes de base pour l'enseignement du français en immersion et en milieu minoritaire. Etude du programme d'études et analyse du matériel didactique.

CU ME 309 Didactique de la communication orale et écrite à l'élémentaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-2). Etude des quatre habiletés langagières. Stratégies d'enseignement et application pratique. Moyens d'intervention, correction et évaluation. Préalable(s): CU ME 308.

CU ME 321 Didactique des mathématiques au niveau élémentaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Initiation à l'enseignement des mathématiques à l'élémentaire. Sujets étudiés: les programmes d'études, stratégies et techniques d'enseignement et d'évaluation, les calculatrices, les ordinateurs, la communication, la pensée et la compréhension mathématique, les influences sur l'enseignement/l'apprentissage des mathématiques, les techniques d'évaluation.

CU ME 322 Didactiques des sciences au niveau élémentaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Initiation à l'enseignement des sciences à l'élémentaire. Sujets étudiés: les programmes du ministère de l'Education, les stratégies et techniques d'enseignement et d'évaluation, le lien entre science/technologie/société.

CU ME 326 Enseignement de l'éducation physique au niveau élémentaire
★3 *(fi 6)* (l'un ou l'autre semestre, 0-3L-0). Les approches pédagogiques pour l'enseignement en français de l'éducation physique à l'élémentaire. La programmation; les diverses méthodologies et stratégies d'enseignement; les systèmes d'évaluation de l'enfant et du programme.

CU ME 330 Didactiques des études sociales à l'élémentaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Initiation à l'enseignement des études sociales à l'élémentaire. Étude et interprétation des exigences du programme du ministère de l'Éducation et des ressources prescrites pour enseigner les études sociales en milieu francophone et en milieu d'immersion française. Se sensibiliser au rôle que jouent les études sociales dans le développement du citoyen. La planification de l'enseignement des études sociales et stratégies d'enseignement. Note: Ce cours n'est pas accessible aux étudiants ayant des crédits pour CU ME 333.

CU ME 339 Enseignement de la musique au niveau élémentaire I
★3 *(fi 6)* (l'un ou l'autre semestre, 0-3L-0). Préalable(s): MUSIQ 151 et 155/156 ou l'équivalent.

CU ME 345 Initiation à la création artistique en milieu scolaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Découverte du langage de l'art, de sa spécificité et de son esthétique. Introduction par atelier aux principes fondamentaux des programmes d'études concernés. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour CU ME 343.

CU ME 347 Les technologies de l'information et de la communication (TIC) en éducation
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-2). Regard critique sur le rôle et la place de la technologie à l'école ainsi que les méthodes d'enseignement propices à son intégration dans les matières de base.

CU ME 358 Enseignement du français au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Cours de méthodologie pour l'enseignement du français en immersion et en milieu francophone minoritaire. Etudes des nouvelles tendances dans la didactique de l'écriture et de la lecture. Comparaison de l'approche traditionnelle et de l'approche fonctionnelle dans l'enseignement de la grammaire. Démarche pour la planification d'une unité en production écrite et pour l'enseignement de la grammaire en contexte communicatif.

CU ME 359 Enseignement de la littérature au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Pédagogie générale et pratique de la littérature: méthode d'enseignement pour le roman, la pièce de théâtre et la poésie. Favoriser la pratique de la lecture libre en français au secondaire. Stratégies de lecture.

CU ME 360 Enseignement des études sociales au 1er cycle du secondaire
★3 *(fi 6)* (premier semestre, 3-0-0). Pédagogie générale et pratique de l'enseignement des études sociales; analyse des programmes d'études sociales pour les francophones en milieu minoritaire et pour le milieu d'immersion française; étude des ressources prescrites par le ministère de l'Education; étude des méthodes d'enseignement et d'évaluation, des objectifs d'apprentissage, et le rôle et les responsabilités de l'enseignant des études sociales. Préalable(s): ★6 dans la spécialisation.

CU ME 361 Enseignement des études sociales au 2e cycle du secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Pédagogie générale et pratique de l'enseignement des études sociales; analyse des programmes d'études sociales et des ressources prescrites par le ministère de l'Education; étude de l'historique des études sociales et des conceptions d'études sociales; étude des méthodes d'enseignement et d'évaluation des études sociales; et intégration des actualités aux objectifs des programmes d'études sociales. Préalable(s) ou concomitant(s): CU ME 360.

CU ME 363 L'enseignement des mathématiques au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Ce cours a pour but de préparer les étudiants à enseigner les mathématiques à tous les niveaux du secondaire; à faire acquérir quelques principes fondamentaux nécessaires à une conception adéquate des mathématiques et de leur didactique. Ce cours propose diverses stratégies pour encourager l'apprentissage des mathématiques d'une façon concrète. Préalable(s): ★3 dans la spécialisation.

CU ME 367 L'enseignement des sciences au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 0-3L-0). Ce cours permettra à l'étudiant de connaître à fond le contenu et les objectifs du curriculum de science à tous les niveaux du secondaire; les différentes méthodes de présenter un concept en science; les nouvelles applications technologiques dans l'enseignement de la science; et l'équipement existant pour faciliter l'enseignement de la science. Préalable(s): ★3 dans la spécialisation.

CU ME 389 L'art dramatique comme outil pédagogique
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Ce cours portera sur les pratiques théâtrales et leur utilisation dans les programmes d'études à l'élémentaire et au secondaire; par exemple, jeux de rôles, marionnettes, improvisation.

CU ME 410 Enseignement de la littérature enfantine
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Familiarisation avec la littérature enfantine. Cours centré sur la création et l'interaction avec le discours littéraire. Sensibilisation au processus de la lecture esthétique.

CU ME 494 Enseignement de l'éducation physique au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 0-3L-0). Les approches pédagogiques pour l'enseignement en français de l'éducation physique au secondaire, la programmation; les diverses méthodologies et stratégies d'enseignement; les systèmes d'évaluation de l'élève et du programme.

O CU ME 496 L'enseignement religieux et l'éducation morale
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0).

CU ME 498 Séminaire dans le domaine de l'enseignement au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 0-3s-0). Le contenu du cours varie d'une année à l'autre. Les sujets sont annoncés avant la période d'inscription. Le titre du cours figurera sur le relevé de notes de l'étudiant.

CU ME 499 Etude personnelle dirigée dans le domaine de l'enseignement au niveau secondaire
★3 *(fi 6)* (l'un ou l'autre semestre, 3-0-0). Préalable(s): l'approbation du professeur et du Vice-doyen aux affaires académiques.

221.48 Dance, DANCE

Faculty of Physical Education and Recreation

Note: See also INT D 439 for a course which is offered by more than one Department or Faculty and which may be taken as an option or as a course in this discipline.

Undergraduate Courses

DANCE 200 The Spectrum of Dance in Society
★3 *(fi 6)* (either term, 1-0-2). The theory and practice of dance as a human physical activity. Focus will be on the aesthetic, expressive, rhythmical dimensions of movement in a culture's artistic and social life. The study will include movement content, techniques, improvisation, composition and performance in a variety of dance forms including modern/creative, social, jazz, and folk dance.

L DANCE 340 Modern Dance
★3 *(fi 6)* (either term, 0-3L-0). The study of creative dance techniques, improvisation, composition, and performance through theory and practical experience.

L DANCE 345 Modern Dance Techniques
★3 *(fi 6)* (either term, 0-3L-0). Development of personal movement skills in a variety of modern dance techniques combined with knowledge of movement and dance principles.

O DANCE 350 International Folk Dance
★3 *(fi 6)* (either term, 0-3L-0). The study of folk dances in selected cultures through theory and practical experience. Theory will focus on costume, music, history, geography, and other elements which influence the dances.

DANCE 431 Study of Dance for Children
★3 *(fi 6)* (either term, 1-0-2). Children's dance from the perspective of the child as creator, performer and spectator. Opportunities to observe, work with and perform for children will be provided. Prerequisite: PEDS 293 and 338.

DANCE 499 Directed Studies
★3 *(fi 6)* (either term, 0-3s-0). An individualized course designed to offer an in-depth study in a dance area not covered by regular courses. Prerequisite: consent of Faculty.

221.49 Dance Activity, DAC

Faculty of Physical Education and Recreation

Goals of DAC Level I
(1) Acquisition of basic skills required in the activity and an appreciation of how these skills are used in combination in performance situations.
(2) Development of the specific theoretical knowledge associated with terminology, history, sociocultural context, rules and organizational aspects, basic strategies and tactics, technique and other concepts relevant to the activity.

Notes
(1) Students enrolled in courses offered by the Faculty of Physical Education and Recreation must take responsibility for ensuring that they are physically and medically fit to be taking such courses. If a student has a physical or medical condition that may compromise his/her participation in a course, it is the student's responsibility to so inform the instructor of that course. Students may contact the Faculty for further information on physical activity requirements and are encouraged to seek medical advice if necessary.
(2) Students are expected to attend the first class of any activity course appropriately dressed for activity participation.

Undergraduate Courses

DAC 155 Social Dance
★1.5 *(fi 3)* (either term, 0-3L-0). Acquisition of theoretical knowledge and personal skill in several variations and sequences of the foxtrot, waltz, tango, jive, rumba, and cha cha. Integral to this will be the development of good partnering and rhythmic abilities.

DAC 160 Jazz Dance
★1.5 *(fi 3)* (either term, 0-3L-0). Acquisition of theoretical knowledge and personal skill in body awareness and placement, locomotion and choreographed jazz dance.

DAC 165 Ballet
★1.5 *(fi 3)* (either term, 0-3L-0). Acquisition of theoretical knowledge and personal skill in either RAD or Cecchetti syllabus, including barre and centre floor work such as positions, port de bras, elevation and travelling.

221.50 Danish, DANSK

Department of Modern Languages and Cultural Studies
Faculty of Arts

Notes
(1) The Department reserves the right to place students in the language course appropriate to their level of language skill.
(2) Placement tests may be administered in order to assess prior background. Students with a Danish language background should consult a Department advisor. Such students may be granted advanced placement and directed to

register in a more advanced course suitable to their level of ability. Students seeking to fulfill their Language Other than English requirement may begin at any one appropriate level, but must take the full ★6 in one language.

(3) The Department will withhold credit from students completing courses for which prior background is deemed to make them ineligible. For example, 100-level courses are normally restricted to students with little or no prior knowledge in that language. Should students with matriculation standing, or those possessing prior background (such as native speakers or those for whom it is their first language) register in the 100-level course, credit may be withheld.

(4) See also Scandinavian (SCAND) listings.

Undergraduate Courses

O DANSK 111 Beginners' Danish I
★3 *(fi 6)* (either term, 5-0-0). Designed to give basic practical skill in everyday spoken and written Danish. The oral approach, using the laboratory, is followed. Note: not to be taken by students with credit in DANSK 100, or with native or near native proficiency, or Danish 30 or its equivalents in Canada and other countries.

O DANSK 112 Beginners' Danish II
★3 *(fi 6)* (either term, 5-0-0). Prerequisite: DANSK 111 or consent of Department. Note: not to be taken by students with credit in DANSK 100, or with native or near native proficiency, or Danish 30 or its equivalents in Canada and other countries.

O DANSK 211 Second-Year Danish I
★3 *(fi 6)* (either term, 4-0-0). Reading and study of selected texts in Danish literature and culture. Conversation and composition. Prerequisite: Danish 30 (or equivalent) or DANSK 112 or consent of Department. Note: not to be taken by students with credit in DANSK 200.

O DANSK 212 Second-Year Danish II
★3 *(fi 6)* (either term, 4-0-0). Prerequisite: DANSK 211 or consent of Department. Note: not to be taken by students with credit in DANSK 200.

221.51 Dental Hygiene, D HYG

Department of Dentistry
Faculty of Medicine and Dentistry

Undergraduate Courses

D HYG 111 Concepts in Dental Hygiene
★2 *(fi 4)* (two term, 38 hours). This course introduces concepts fundamental to the Dental Hygiene process of care in a variety of practice environments including clinical practice, education, community health and administration. Particular emphasis is given to the determinants of health and to oral disease prevention. Also introduces protocols essential for entry into the clinical component of the Dental Hygiene Program.

D HYG 202 Head and Neck Anatomy
★1 *(fi 2)* (either term, 16 hours). Detailed gross anatomy of the head and neck. Focus is on structures that are present, their relationships and interactions with each other and on understanding malfunction. Open to dental hygiene students or with permission of the course coordinator.

D HYG 211 Dental Hygiene Theory and Practice
★5.5 *(fi 11)* (two term, 84 hours). A lecture course integrating the knowledge and practice of clinical dental hygiene. This course is structured around the four key areas of responsibility for the clinical dental hygienist, namely oral assessment, treatment planning, disease prevention and health maintenance and dental hygiene therapy.

D HYG 212 Preclinical Dental Hygiene
★6 *(fi 12)* (either term, 180 hours). An introduction to fundamental techniques in disease control, instrumentation, assessment techniques, and related clinical procedures are presented and discussed.

D HYG 213 Introduction to Clinical Practice I
★3 *(fi 6)* (either term, 102 hours). A clinical course integrating the knowledge, practice, and skills of dental hygiene practice.

D HYG 215 Biomaterials
★2 *(fi 4)* (two term, 28 hours). The course is designed to give the dental hygiene students a general knowledge of dental materials, to allow them to recognize the various dental materials and to have some knowledge of their manipulation and application, and to be able to intelligently discuss the clinical applications and problems associated with the materials with both the dentist and patient.

D HYG 220 Oral Health Education
★3 *(fi 6)* (either term, 54 hours). An introduction to the principles of dental health education, construction and utilization of audiovisual materials, the operation of audiovisual equipment and instructional preparation for group education is included.

D HYG 222 Population Health and Health Promotion
★2 *(fi 4)* (two term, 36 hours). Population Health and Health Promotion is that portion of the dental hygiene curriculum which prepares students with a broad understanding of the factors that affect the health and well-being of the total population. It will provide students with an understanding of the determinants of health and suggest strategies for working with other disciplines and community agencies to affect health outcomes. It will also provide students with the knowledge and skills to assess the need for a plan and deliver appropriate services to meet oral health needs on a community basis.

D HYG 230 Dental Anatomy
★1.5 *(fi 3)* (either term, 20 hours). A self-study course that is concerned with nomenclature, biologic considerations of tooth form and function; permanent and deciduous teeth are studied in detail.

D HYG 231 Office Emergencies
★1 *(fi 2)* (either term, 14 hours). This is a lecture course that will include the etiology, symptoms, and primary treatment methods associated with disease entries that have the potential of constituting a dental office emergency.

D HYG 232 Dental Specialties
★1.5 *(fi 3)* (either term, 35 hours). Introduction to specialties in dental practice and the role of the dental hygienist in each area. A clinical rotation in each specialty is included.

D HYG 240 Radiology
★2 *(fi 4)* (two term, 37 hours). A comprehensive didactic, pre-clinical and clinical course that deals with the production of x-rays, their interactions with matter, radiation biology and protection, the appearances of normal anatomy on radiographs and common abnormalities seen on radiographs made in the practice of dental hygiene. Pre-clinical and clinical sessions will introduce students to the basic techniques of intraoral radiography and pantomography.

D HYG 313 Clinical Practice II
★16 *(fi 32)* (two term, 484 hours). An advanced clinical course that focuses on oral assessment, disease prevention, and dental hygiene therapies for clients with chronic and acute variances in oral health through the integration of research evidence and dental hygiene practice skills.

D HYG 316 Management of Special Needs
★2.5 *(fi 5)* (two term, 40 hours). A lecture course and a practical clinical rotation that emphasizes client centered management and care of clients with special needs; the physically compromised, the mentally compromised, the sensory compromised and the medically compromised. Students are responsible for completing relevant projects for course evaluation.

D HYG 317 Ethics, Practice, and Leadership I
★3 *(fi 6)* (two term, 45 hours). A team instructed course that will provide students with a framework for critiquing scientific literature and the implications for dental hygiene practice, and an opportunity to conduct a leadership project within their community and present their project to peers in a scientific meeting format. This course will also discuss many issues related to the practice of dental hygiene.

D HYG 321 Oral Health Education II
★2 *(fi 4)* (either term, 52 hours). A continuation of D HYG 220. The application of educational theory to teaching is provided by field experience in a variety of community settings.

D HYG 322 Community and Preventive Dentistry
★1 *(fi 2)* (either term, 14 hours). Focus on the dental hygienist's role in promoting health in the community, with an emphasis on epidemiology, research methodologies, program planning and delivery. Students will plan a model community dental health program using a systems approach.

D HYG 326 Periodontology for the Dental Hygienist
★2.5 *(fi 5)* (two term, 38 hours). Periodontology is an integral part of the practice of dental hygiene. This course provides foundational knowledge in the science of Periodontology, as well as an emphasis on non-surgical and surgical periodontal therapies. Through this knowledge, integrated with case studies and presentations, students are able to assess, plan, implement and evaluate client centered evidence based dental hygiene therapy.

D HYG 329 External Rotation
★2.5 *(fi 5)* (two term, 75 hours). Each student spends two weeks at an external dental clinic. During this period, students will provide a broad range of health promotional activities including preventive dental hygiene therapies, classroom education and oral health instruction. The aim of this program is to provide a private practice clinical experience or a community focused opportunity to provide primary and secondary oral health interventions.

D HYG 340 Dental Radiography
★1 *(fi 2)* (two term, 24 hours). A clinical course in which students will gain further experience in intraoral radiography and pantomography. Students will also gain limited experience in radiographic interpretation.

D HYG 345 Geriatrics
★1 *(fi 2)* (either term, 14 hours). An introductory course describing the needs of

the elderly. Examines the changing population balance in Canada involving both medical and dental aspects of people over sixty years of age.

D HYG 386 Anaesthesia
★2.5 *(fi 5)* (either term, 60 hours). A didactic and lab course covering anatomy, physiology, and pharmacology of different anaesthetics. Local anaesthetic techniques covering all types of infiltration and intraoral blocks from the major component of the clinic-laboratory sessions. Students will also be able to describe the techniques, drug reactions and complications involving the use of local anesthetics and have practical experience in the administration of local anesthetic drugs.

D HYG 413 Advanced Practicum
★7 *(fi 14)* (first term, 190 hours). This six month program will provide students with advanced clinical practice opportunities. The practicum component may encompass hospital, community, and/or dental hygiene practice.

D HYG 417 Practice Management and Leadership
★3 *(fi 6)* (either term, 39 hours). This course will provide dental hygiene students with an understanding of dental hygiene as a business operation. It will provide an opportunity for the dental hygiene students to explore and articulate their own philosophy to dental hygiene practice. Additionally, this course will provide a framework to enable the students to develop a business plan for a dental hygiene practice.

D HYG 422 Community Oral Health Promotion
★2 *(fi 4)* (either term, 26 hours). Focus on the dental hygienist's role in promoting health in the community, with an emphasis on epidemiology, research methodologies, program planning and delivery. Students will plan a model community dental health program using a systems approach.

D HYG 440 Advocacy for Change in Healthcare
★3 *(fi 6)* (either term, 39 hours). Provides an overview of the professional, social, political and global trends and issues affecting health and health care delivery. Through the application of a framework for planned change, this course will demonstrate how health care professionals can act as change agents in society.

221.52 Dentistry, DENT

Department of Dentistry
Faculty of Medicine and Dentistry

Graduate Courses

DENT 532 Growth and Development
★2 *(fi 4)* (second term, 2-0-0). A detailed review of the postnatal growth and development of human craniofacial structures. Longitudinal and cross sectional growth data are presented.

DENT 540 Orthodontic Seminars
★4 *(fi 8)* (two term, 175 hours). Selected orthodontically related theoretical and practical topics along with orthodontic case management presentations are discussed in both seminar and preclinical formats.

DENT 541 Orthodontic Clinics
★2 *(fi 4)* (two term, 525 hours). Applied clinical education and experience is obtained through supervised management of selected orthodontic cases.

DENT 542 Research Methodology
★1 *(fi 2)* (two term, 30 hours). Review of scientific methodology and direction of students in technic of evaluating dental literature. A research proposal or literature review is required as part of this course.

DENT 551 Introduction to Applied Statistics
★3 *(fi 6)* (either term, 39 hours). Analysis of variance, multiple linear regressions, measures of association and agreement, logistic regression, and non-parametric methods. Topics will also include sample size calculation, power analysis, and a brief introduction to meta-analysis. The concepts will be motivated by problems in the dental and medical sciences. Applications to real data will be emphasized through the use of SPSS, Splus and R.

DENT 552 Applied Multivariate Statistical Analysis
★3 *(fi 6)* (Spring/Summer, 39 hours). Multivariate analysis of variance, repeated measures, multivariate linear regression, principal components, discriminant analysis, cluster analysis, and multidimensional scaling will be studied. Topics will also include shape analysis in three dimensions. The concepts will be illustrated by problems in dentistry and the medical sciences. Each student will submit a written report and present a research project focusing on these statistical methods. Applications to real data will be emphasized through the use of SPSS, Splus and R. Prerequisite: DENT 551.

DENT 562 TMD/Orofacial Pain
★2 *(fi 4)* (second term, 75 hours). Seminars in the diagnosis and treatment of temporomandibular joint problems. Includes a comprehensive literature review. Emphasis placed on orthodontic considerations in the prevention and management of mandibular dysfunction. (Course offered in alternate years.)

DENT 565 Evidence Based Dentistry
★2 *(fi 4)* (first term, 26 hours). This course focuses on the general principles of evidence based dentistry. It will cover some basic principles of epidemiology, formulation of the clinical question, search and acquisition of available scientific evidence, critical appraisal and application of evidence in a dentistry context. A final written assignment is a course requirement.

DENT 566 Systematic Reviews in Dentistry
★2 *(fi 4)* (second term, 26 hours). This course focuses on the general principles of Systematic Review and Meta-Analysis in Dentistry. It will cover principles, procedures, problems and limitations in Systematic Reviews. Different types of Systematic Reviews would be analyzed. Use of Meta-Analysis as a statistical tool in Systematic Reviews will be also covered. Submission of a Systematic Review to a peer reviewed journal is a course requirement. Prerequisite: DENT 565.

DENT 640 Orthodontic Seminars
★3 *(fi 6)* (two term, 145 hours). Second year seminar and preclinical presentations. Requires successful completion of DENT 540.

DENT 641 Orthodontic Clinics
★8 *(fi 16)* (two term, 840 hours). Second year applied clinical educational program. Requires successful completion of DENT 541.

DENT 741 Orthodontic Clinics
★8 *(fi 16)* (two term, 840 hours). Third year applied clinical educational program. Requires successful completion of DENT 641.

DENT 800 Special Registration
★0 *(fi 0)* (either term, unassigned). Dentistry undergraduate and postgraduate students who have been admitted to the University of Alberta Faculty of Medicine and Dentistry as a Visiting Student in accordance with the Faculty guidelines will be required to register in this course for the purpose of entitlement to the University library and registration in the Alberta Dental Association and College Education Register if applicable.

221.53 Dentistry, DDS

Department of Dentistry
Faculty of Medicine and Dentistry

Undergraduate Courses

DDS 506 Gastroenterology and Nutrition
★5 *(fi 10)* (either term, 6 weeks). An integrated course covering nutrition, gastrointestinal physiology, pathophysiology and anatomy. Related surgical, paediatric and geriatric topics will also be addressed. Open only to students registered in the DDS program.

DDS 507 Neurosciences
★9 *(fi 18)* (either term, 11 weeks). Fundamental Clinical Neurosciences taught in an integrated fashion. Involves instruction in subject areas related to the head and neck, including Neuroanatomy, Neurophysiology, Neuropathology, Neuropharmacology, Neuroradiology, Neurology, Neurosurgery, Psychiatry, Rehabilitation Medicine, Otorhinolaryngology, and Ophthalmology. Open only to students registered in the DDS program.

DDS 508 Oncology
★2 *(fi 4)* (either term, 2 weeks). Principles and concepts of clinical oncology. Open only to students registered in the DDS program.

DDS 509 Pre-Clinical Practice of Dentistry I
★12 *(fi 24)* (either term, 10 weeks). An introduction to the art and science of clinical practice. Building on the foundation of epidemiology, bacteriology, and gross and microscopic anatomy of the teeth and jaws, students develop an understanding of the genesis of the carious process, and study the restoration of carious teeth and the related rationale. An introduction to the radiographic imaging process and interpretation of radiographs. Students use restoration materials and learn their physical and chemical properties. The principles of occlusion are also introduced.

DDS 510 Patient-Centred Care
★6 *(fi 12)* (two term, 2-6s-0). A discussion of dental skills which may be generalized across different disease states and different specialties. Topics include epidemiology, evidence-based dentistry and public health, history-taking and clinical skills in patients of all age groups and backgrounds, ethics, family issues, health in specific sections of the community and related areas. Open only to students registered in the DDS program. Corequisite: INT D 410.

DDS 514 Anatomy (Dental)
★2 *(fi 4)* (either term, 60 hours). Coronal, radicular and pupal morphology of the primary and permanent dentitions.

DDS 518 Oral Biology I
★4 *(fi 8)* (either term, 60 hours). Development, histology, and comparative anatomy of the craniofacial complex and dental tissues.

DDS 520 Patient-Centred Care
★6 *(fi 12)* (two term, 2-6s-0). A continuation of DDS 510, which involves further

discussion of medical skills which may be generalized across different disease states and different specialties. Open only to students registered in the DDS program.

DDS 522 Reproductive Medicine and Urology
★1 *(fi 2)* (either term, 7 weeks). A brief overview of the reproductive medicine and urology appropriate for those in the DDS program. Open only to students registered in the DDS program.

DDS 523 Musculoskeletal System
★6 *(fi 12)* (two term, 7 weeks). Anatomy, physiology, pathophysiology and management in the musculosketal system. Open only to students registered in the DDS program.

DDS 529 Pre-Clinical Practice of Dentistry II
★25 *(fi 50)* (two term, 20 weeks). Students begin studying all phases of clinical dentistry including diagnosis and treatment planning, anaesthesia, periodontics, endodontics, fixed and removable prosthodontics and orthodontics. An introduction to ethics in dentistry. Students are introduced to the clinic, and limited diagnosis and treatment of patients begin.

DDS 532 Oral Biology II
★4 *(fi 8)* (two term, 60 hours). A multidisciplinary course that examines the unique physiology, biochemistry and nutritional requirements of the oral cavity. Topics include functions of the periodontal tissues, the temporomandibular joint, mastication, swallowing, speech, special reflexes involving cranial nerves, receptors of the stomatognathic system, and salivary glands and the role of saliva in caries. Oral manifestations of metabolic disease, the physiology of pain, and the role of nutrition in the development of oral tissues and the maintenance of oral health will also be discussed.

DDS 533 Oral Pathology
★2 *(fi 4)* (either term, 30 hours). The diagnosis, pathology and treatment of common diseases of the oral and maxillofacial structures.

DDS 541 Dental Pharmacology
★1 *(fi 2)* (either term, 15 hours). An introduction to the principles of pharmacology including mechanisms of drug action; pharmacokinetics and drug metabolism; and mechanisms of drug interactions and adverse drug reactions. These principles will be applied to groups of drugs acting on various organ systems of the body, representative drugs being selected whenever possible for their physiological and clinical significance to the practice of dentistry. Particular emphasis will be placed on anaesthetics, antacoids, autonomic drugs and drugs with selective toxicity employed in infections and malignancies.

DDS 545 Clinical Practice I
★52 *(fi 104)* (two term, 40 weeks). An introduction to the art and science of clinical dentistry in the patient care setting. Utilizing a patient-centered approach, students develop the skills to diagnose and develop a treatment plan addressing patients' needs; to deliver basic restorative dentistry; to perform basic endodontic procedures; to assist in oral surgery; to provide periodontal therapy from basic to more advanced needs; to treat pediatric patients; to deliver basic removable prosthodontic services; to provide basic fixed prosthodontic services that may incorporate dental implantology; and to manage basic orthodontic needs of patients. Diagnostic services such as radiology are incorporated during the diagnosis and treatment. Students learn to manage ethical dilemmas and provide care according to existing codes of ethics. Students gain their clinical experience at intramural and extramural sites.

DDS 547 Geriatrics
★1 *(fi 2)* (either term, 15 hours). An introductory course describing the needs of the elderly. The course will examine the changing population balance in Canada involving both medical and dental aspects of people over 60 years of age.

DDS 549 Oral Biology III
★3 *(fi 6)* (two term, 70 hours). A seminar course designed to give the student an appreciation and understanding of current areas of research in dentistry and the experimental approaches used. Students will be required to design and carry out an independent research project under the guidance of a faculty member.

DDS 555 Practice Management
★1 *(fi 2)* (either term, 15 hours). This course introduces the third-year dental students to practice management topics and concepts necessary for today's successful practice of dentistry. These topics include financial planning, banking, dental office records, different modes of practice, marketing, and time management. The emphasis is to achieve an awareness of how these topics affect a dentist in today's society.

DDS 565 Clinical Practice II
★50 *(fi 100)* (two term, 30 weeks). A clinical course building on Clinical Practice I with emphasis on more complex patient needs involving all disciplines. Students perform oral surgery procedures as the prime operator. Students are also assigned to external programs such as the satellite clinics. A hospital rotation is included (University of Alberta Hospitals and Glenrose Hospital). Students deliver comprehensive dental care in a Clinical Teaching Unit. The approved research project designed in DDS 549 will be completed and presented in the senior year.

221.54 Dentistry/Medicine, DMED

Department of Dentistry
Faculty of Medicine and Dentistry

Undergraduate Courses

DMED 511 Introduction to Medicine and Dentistry
★3 *(fi 6)* (either term, 5 weeks). An introduction to the basic health science with a review of some aspects of the essential biochemistry, physiology, anatomy and pharmacology. Particular emphasis on basic medical genetics. Open only to students registered in the MD or DDS program.

DMED 512 Infection, Immunity and Inflammation
★6 *(fi 12)* (either term, 7 weeks). Basic and clinical aspects of immunity, inflammation and infection, including relevant parts of haematology. Infection with various classes of micro-organisms, and the appropriate management is an important focus. Open only to students registered in the MD or DDS program.

DMED 513 Endocrine System
★6 *(fi 12)* (either term, 6 weeks). An examination of the endocrine system in health and disease, with particular reference to the mechanisms of disturbances in the endocrine system, and the management of these conditions. Open only to students registered in the MD or DDS program.

DMED 514 Cardiovascular, Pulmonary and Renal Systems
★11 *(fi 22)* (either term, 14 weeks). The normal function of the heart and blood vessels, lungs and kidney, the changes in these functions which occur in disease and the management of the conditions which result from such changes in function. Open only to students registered in the MD or DDS program.

221.55 Design, DES

Department of Art and Design
Faculty of Arts

Note: Since presence at lectures and seminars, participation in classroom discussion, and the completion of assignments are important components of most courses, regular attendance is expected.

This particularly applies to studio courses where attendance will be a factor in grading.

Students are expected to have successfully completed prerequisite course(s) with a minimum grade of B-. Consent of Department may be withheld in cases where the grade in a prerequisite course is below a B-.

Undergraduate Courses

DES 135 Design Fundamentals
★3 *(fi 6)* (either term, 0-6L-0). Studio-based introduction to the conceptual and practical concerns of the design disciplines. Two- and three-dimensional design-related studies. Note: ART 134 and DES 135 are required prerequisites for senior level ART or DES courses. Not open to students with credit in ART 131 or ART 132.

DES 138 Design Fundamentals I
★3 *(fi 6)* (first term, 0-6L-0). Studio-based introduction to the conceptual and practical concerns of the design disciplines. Two- and three-dimensional design-related studies. Note: Restricted to BFA and BDesign students.

DES 139 Design Fundamentals II
★3 *(fi 6)* (second term, 0-6L-0). Further study of the conceptual and practical concerns of the design disciplines. Two- and three-dimensional design-related studies. Note: Restricted to BFA and BDesign students.

DES 268 Introduction to Studio
★3 *(fi 6)* (first term, 0-6L-0). Directed study in one subject embraced by DES 370 or DES 390. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138, and consent of Department. Note: Restricted to students in the Faculty of Education only. Formerly DES 368.

DES 337 Special Projects in Studio Disciplines
★6 *(fi 12)* (two term, 0-6L-0). Special projects in studio disciplines by special arrangement with the Department. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138, and consent of Department. Formerly DES 339.

DES 338 Special Projects in Studio Disciplines
★3 *(fi 6)* (either term, 0-6L-0). An introductory design course intended to meet special teaching needs not otherwise satisfied under existing course offerings. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department.

DES 370 Foundations of Industrial Design
★6 *(fi 12)* (two term, 0-6L-0). Introduction to the principles, methods and techniques of industrial design. Studies of three dimensional design address concept, form and function in a social/environmental context and involve practical, hands-on projects combining theory and practice in two and three dimensions. Prerequisites:

ART 134 and DES 135, or ART 136 and DES 138, and consent of Department. Formerly DES 372.

DES 375 Introduction to Visual Presentation (Non-Electronic)
★3 *(fi 6)* (either term, 0-6L-0). Introductory studies in model and graphics based projects implementing the materials and processes of traditional visualization methods and media. Prerequisites or corequisites: DES 370 and consent of the Department.

DES 376 Introduction to Visual Presentation (Electronic)
★3 *(fi 6)* (either term, 0-6L-0). Introductory studies in model and graphics based projects implementing the materials and processes of traditional visualization methods and media. Prerequisites or corequisites: DES 370 and consent of the Department.

DES 384 Introduction to Integrative Design
★3 *(fi 6)* (either term, 0-6L-0). Introductory studies include 3-D model building, application of type, symbols, and signage in 3-D environments, materials and fabrication, and printing processes. Pre- or corequisites: DES 370 or 390 and consent of Department. Not to be taken by students with credit in both DES 370 and 390.

DES 390 Foundations of Visual Communication Design
★6 *(fi 12)* (two term, 0-6L-0). Introduction to the principles, methods and techniques of visual communication design. Study of communication concerns through the integration of photography and typography. Emphasis on appropriateness, clarity, expression and description. Introduction to information and publication design problems. Prerequisites: ART 134 and DES 135, or ART 136 and DES 138, and consent of Department. Formerly DES 392.

DES 395 Introduction to Form, Visual Elements and Systems
★3 *(fi 6)* (either term, 0-6L-0). Structure, representation and expression. Creation, observation and categorization. Form, color and tone systems in contemporary and historical design, and in the environment. Prerequisites or corequisites: DES 390 and consent of Department.

DES 396 Introduction to Research and Theory in Design
★3 *(fi 6)* (either term, 0-6L-0). Introduction to information gathering methods, literature search and empirical research. Problem identification and definition. Purposes, goals, design and evaluation methods. Communication theory. Prerequisites or corequisites: DES 390 and consent of Department.

DES 425 Word and Image: Intermediate Projects in Printmaking for Designers and Artists
★6 *(fi 12)* (two term, 0-6L-0). Exploration of the multiple relationships between word and image generated through consideration of text. Prerequisites: ART 322 and DES 390. Note: Registration priority will be given to BDesign Printmaking Route students. Not open to students who have successfully completed ART 425.

DES 437 Special Projects in Studio Disciplines
★6 *(fi 12)* (two term, 0-6L-0). Special projects in studio disciplines by special arrangement with the Department. Prerequisite: consent of Department. Formerly DES 439.

DES 438 Special Projects in Studio Disciplines
★3 *(fi 6)* (either term, 0-6L-0). An intermediate design course intended to meet special teaching needs not otherwise satisfied under existing course offerings. Prerequisite: Consent of Department.

DES 470 Intermediate Industrial Design Principles and Practices
★6 *(fi 12)* (two term, 0-6L-0). Subject areas include research methods and the design process; communication skills and collaborative dynamics; human factors; the psychology of design; material properties and applications for fabrication and production; market considerations. Projects are 2-D, 3-D, and computer based. Prerequisites: DES 370 and consent of Department.

DES 475 Product Design Principles and Practices I
★3 *(fi 6)* (either term, 0-6L-0). A studio-based course which implements design principles and practices with a focus on their application to product design for batch production and mass production. Experimentation and concept development with computer technology. 2-D media, and 3-D models and mock-ups. Prerequisites or corequisites: DES 470 and consent of Department.

DES 477 Furniture Design Principles and Practices I
★3 *(fi 6)* (either term, 0-6L-0). A studio-based course which implements design principles and practices with a focus on their application to furniture design for batch production and mass production. Experimentation and concept development with computer technology, 2-D media, and 3-D models and prototypes. Prerequisite or corequisite: DES 470 and consent of Department.

DES 483 Seminar on Design Issues
★3 *(fi 6)* (either term, 0-3s-0). Contemporary design issues in the fields of theory, criticism, history, professional practice and social concerns. Restricted to third-year Bachelor of Design students. Prerequisite(s): ART H 209 and/or consent of Department.

DES 484 Integrative Design Principles and Practices I
★3 *(fi 6)* (first term, 0-6L-0). Studio-based course which integrates Visual Communication Design and Industrial Design concepts and practices. Individual and group projects address subjects including: signs, symbols, and communication; as well as products, packaging, and graphics. Prerequisites: DES 370 and 390, or DES 370 and 384, or DES 390 and 384, and consent of Department. Note: Not open to students with credit in DES 482.

DES 485 Integrative Design Principles and Practices II
★3 *(fi 6)* (second term, 0-6L-0). Studio-based course which integrates Visual Communication Design and Industrial Design concepts and practices. Individual and group projects address subjects such as point of purchase displays and retail environments, combining 2-D and 3-D considerations. Prerequisites: DES 370 and 390, or DES 370 and 384, or DES 390 and 384, and consent of Department. Note: Not open to students with credit in DES 482.

DES 490 Concepts and Systems in Visual Communication Design
★6 *(fi 12)* (two term, 0-6L-0). Systematic approaches to typographic, graphic and diagrammatic communication, image creation and manipulation. Introduction to the computer as a tool for language and visual communication. Black and white photography. Project management and research. Prerequisites: DES 390 and consent of Department. Formerly DES 492.

DES 495 The Image I
★3 *(fi 6)* (first term, 0-6L-0). Further studies in the use of the photographic image in the design context. The communicative function of the image. Representation, description, expression and persuasion. History and theory of the use of images. Prerequisites or corequisites: DES 490 and consent of Department.

DES 496 The Image II
★3 *(fi 6)* (second term, 0-6L-0). Complex image creation for communicational purposes mainly in electronic media. Introduction to criticism. Prerequisites or corequisites: DES 490 and consent of Department.

DES 497 Advanced Typography
★3 *(fi 6)* (either term, 0-6L-0). Typography in the context of language communication. Design of letterforms. The study of notation schemes. The history of letterforms, history of printing and book design. Prerequisite or corequisite: DES 490 and consent of Department.

DES 498 Information Design
★3 *(fi 6)* (either term, 0-6L-0). Text, tables, charts, diagrams and electronic displays. User-machine interaction: perception and cognition. Visual presentation of abstract and quantitative information. Prerequisite or corequisite: DES 490 and consent of Department.

DES 525 Word and Image: Advanced Projects in Printmaking for Designers and Artists
★6 *(fi 12)* (two term, 0-6L-0). Exploration of the multiple relationships between word and image generated through consideration of text. Prerequisite: DES 425 or ART 425. Note: Registration priority will be given to BDesign Printmaking Route students. Not open to students who have successfully completed ART 525.

DES 537 Special Projects in Studio Disciplines
★6 *(fi 12)* (two term, 0-6L-0). Special projects in studio disciplines by special arrangement with the Department. Prerequisite: consent of Department. Formerly DES 539.

DES 538 Special Projects in Studio Disciplines
★3 *(fi 6)* (either term, 0-6L-0). An advanced design course intended to meet special teaching needs not otherwise satisfied under existing course offerings. Prerequisite: consent of Department.

DES 570 The Practice of Industrial Design
★6 *(fi 12)* (two term, 0-6L-0). Subject areas include design and culture; human factors; social, environmental and economic implications of design; appropriate technologies; production considerations; product marketing and case studies; design and project management; professional, business and legal implications. Projects may be realized in any or all available media. Prerequisites: DES 470 and consent of Department.

DES 575 Product Design Applications and Product Technologies
★3 *(fi 6)* (either term, 0-6L-0). A studio-based course in which projects address the requirements of special user groups and specific markets with special consideration of the production capabilities of western Canada. Computer Aided Design and Computer Aided Manufacturing will be the focus of at least one project. Prerequisites or corequisites: DES 570 and consent of Department.

DES 576 Furniture Design Applications and Production Technologies
★3 *(fi 6)* (either term, 0-6L-0). A studio-based course in which projects address the requirements of special user groups and specific markets with special consideration of the production capabilities of western Canada. Computer Aided Design and Computer Aided Manufacturing will be the focus of at least one project. Prerequisites or corequisites: DES 570 and consent of Department.

DES 577 Product and Furniture Design Systems
★3 *(fi 6)* (either term, 0-6L-0). A seminar/studio based course that focuses on systems analysis and application in product and furniture design. With a special regard for the economics of manufacture and marketing. Prerequisite or corequisite: DES 570 and consent of Department.

DES 584 Integrative Design Applications I
★3 *(fi 6)* (either term, 0-6L-0). A 2-D/3-D studio-based course in which projects

address the research, development and fabrication requirements of educational and interpretive design, with special consideration of technological and cultural contexts. Prerequisites: DES 484 and/or DES 485 and consent of Department.

DES 585 Integrative Design Applications II
★3 *(fi 6)* (either term, 0-6L-0). A 2-D/3-D studio-based course in which projects address the research, development and fabrication requirements of commercial applications of design in specific settings, with special consideration of technological and cultural contexts. Prerequisites: DES 484 and/or DES 485 and consent of Department.

DES 586 Design Practicum I
★3 *(fi 6)* (first term, 0-6L-0). Design internship in design offices, industry, museums and other appropriate professional hosts and venues, bridging formal education and professional practice. Prerequisite: consent of Department.

DES 587 Design Practicum II
★3 *(fi 6)* (second term, 0-6L-0). Design internship in design offices, industry, museums and other appropriate professional hosts and venues, bridging formal education and professional practice. Prerequisite: consent of Department.

DES 590 The Practice of Graphic Design
★6 *(fi 12)* (two term, 0-6L-0). Applied practical projects and complex design systems. Problem definition, strategic planning, project management and design evaluation. Project brief and production specifications, professional practice, procedures, codes of ethics, pricing and intellectual property. Prerequisites: DES 490 and consent of Department. Formerly DES 592.

DES 595 Communication Design for Interactive Media I
★3 *(fi 6)* (either term, 0-6L-0). Design for information, education and instruction using multimedia, Navigation, interface design in the context of human-machine interaction. Complex information systems, project planning and development strategies. Prerequisites or corequisites: DES 590 and consent of department.

DES 596 Communication Design for Interactive Media II
★3 *(fi 6)* (either term, 0-6L-0). Design issues in new communication media. Open information structures and networks as complex hierarchical systems. Internet as an information resource, research tool and mass communication media. Navigation, interaction and interface design in hypermedia. Prerequisites: DES 592 and consent of Department. Corequisite: DES 590.

DES 597 Design Management
★3 *(fi 6)* (either term, 0-6L-0). Project and office management. Design methods and evaluation, systems theory, writing for design. Introduction to marketing and social marketing, motivational and audience studies. Prerequisite or corequisite: DES 590 and consent of Department.

DES 598 Image, Sound and Narrative in Multimedia
★3 *(fi 6)* (either term, 0-6L-0). Advanced exploration of the relationship between sound, image and narrative structures using current computer programs for computer-based multimedia productions. Emphasis on planning, design and planning skills, project management and team work. Prerequisite or corequisite: DES 590 and consent of Department.

Graduate Courses

DES 672 Industrial Design: Concepts, Analysis and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

DES 673 Industrial Design: Conceptual Analysis and Practical Applications
★10 *(fi 20)* (either term, 0-18L-0).

DES 675 Industrial Design: Directed Readings
★3 *(fi 6)* (either term, 0-3s-0).

DES 692 Visual Communication Design: Concepts, Analysis and Criticism
★10 *(fi 20)* (either term, 0-18L-0).

DES 693 Visual Communication Design: Conceptual Analysis and Practical Applications
★10 *(fi 20)* (either term, 0-18L-0).

DES 695 Visual Communication Design: Directed Readings
★3 *(fi 6)* (either term, 0-3s-0).

221.56 Drama, DRAMA

Department of Drama
Faculty of Arts

Undergraduate Courses

O DRAMA 101 Introduction to Theatre Art
★3 *(fi 6)* (either term, 3-0-0). The origins and development of theatre art; introduction to theatre aesthetics. This course requires the payment of additional miscellaneous fees. See §22.2.3 for details. Note: Not normally to be taken by BA Drama Majors or BA (Honors) Drama students.

L DRAMA 102 Play Analysis
★3 *(fi 6)* (either term, 3-0-0). Understanding of Drama through critical analysis of plays and its application to creative solutions in their production. Note: Not to be taken by BA Drama Majors, BA (Honors) Drama students, or BEd (Secondary) Drama Majors.

DRAMA 103 Critical Analysis of Playtexts
★3 *(fi 6)* (either term, 3-0-0). Analysis of playtexts in reference to the specific challenges faced by actors, directors, designers, and dramaturgs. Note: Restricted to BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama majors, or admission by consent of Department based on successful completion of Drama 30 or equivalent. Not to be taken by students with credit in DRAMA 102.

L DRAMA 149 Dramatic Process I
★3 *(fi 6)* (either term, 0-6L-0). Speech and movement improvisation with an emphasis on imaginative development; introduction to the process of acting and to dramatic form. Note: Designed for students with little or no previous background in Drama. Not to be taken by BA Drama majors, BA (Honors) Drama students, or BEd (Secondary) Drama Majors.

DRAMA 150 Introduction to Dramatic Process
★3 *(fi 6)* (first term, 0-6L-0). Dramatic improvisation as an introduction to the process of acting and to dramatic form. Prerequisite: consent of Department. Note: Restricted to BA Drama Majors, BA (Honors) Drama students, BEd (Secondary) Drama Majors, and BFA (Technical Theatre; Stage Management) students, or admission by consent of Department based on successful completion of Drama 30 or equivalent. Note: Not to be taken by students with credit in DRAMA 149.

L DRAMA 208 Theatre History I
★3 *(fi 6)* (first term, 3-0-0). Development of the styles and crafts of the mise-en-scène, and of the relationship between the playing space and the audience, in the European theatre from ancient Greece to 1650. Prerequisite: Drama 101 or 102 or 103 or consent of Department. Note: Required for BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama Majors. Not to be taken by students with credit in DRAMA 304.

DRAMA 209 Theatre History II
★3 *(fi 6)* (second term, 3-0-0). History of the European theatre from 1650 to 1900, focusing on acting styles, architecture, and conventions of production and performance. Prerequisite: DRAMA 208 or consent of Department. Note: Not to be taken by students with credit in DRAMA 304.

DRAMA 240 Oral Communication and Interpretation
★3 *(fi 6)* (either term, 0-6L-0). Voice and speech development and oral interpretation. Prerequisite: DRAMA 149 or 150 or consent of Department. Note: Restricted to BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama Majors. Not to be taken by students with credit in DRAMA 247.

O DRAMA 247 Introduction to Oral Communication
★3 *(fi 6)* (either term, 0-6L-0). Exploration of basic techniques of oral communication and oral interpretation drawing from various forms of literature. Note: Not to be taken by BA Drama majors, BA (Honors) Drama students, or BEd (Secondary) Drama Majors.

DRAMA 249 Dramatic Process II
★3 *(fi 6)* (either term, 0-6L-0). The theory and practice of improvisation and its application to dramatic form. Prerequisite: DRAMA 149 or 150. Note: Not normally to be taken by BA Drama Majors, BA (Honors) Drama, or BEd (Secondary) Drama Majors. Not to be taken by students with credit in DRAMA 259 or 359.

DRAMA 257 Scene Study I
★3 *(fi 6)* (either term, 0-6L-0). Study of acting, including the analysis and enactment of scripted scenes, and characterization. Prerequisites: one of DRAMA 102 or 103 and one of 149 or 150; or consent of Department. Note: Priority will be given to BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama Majors and Minors. Not to be taken by students with credit in DRAMA 353.

DRAMA 259 Performer-Created Theatre
★3 *(fi 6)* (either term, 0-6L-0). Practice in and theory of the collaborative development of dramatic performance using improvisation and other techniques. Prerequisites: DRAMA 102 or 103, and 149 or 150 or consent of Department. Note: Priority given to BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama Majors. Not to be taken by students with credit in DRAMA 249 or 359.

DRAMA 279 Introduction to Stagecraft and Design
★3 *(fi 6)* (either term, 3-0-0). Production techniques, construction, mechanics, lighting and design. Note: Priority given to BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama Majors and Minors. Note: Not to be taken by students with credit in DRAMA 379.

DRAMA 301 History of Twentieth-Century Canadian Theatre to 1967
★3 *(fi 6)* (either term, 3-0-0). Evolution of theatre art in English/French Canada from 1900 to 1967, with reference to the actors, directors, playwrights, spaces

and major trends in the Canadian theatre. Note: Not to be taken by students with credit in DRAMA 303.

DRAMA 302 Modern Canadian Theatre
★3 *(fi 6)* (either term, 3-0-0). Development in Canadian theatre and drama since 1967. Note: Not to be taken by students with credit in DRAMA 403.

DRAMA 306 Historical Approaches to Western Dramatic and Theatrical Theories
★3 *(fi 6)* (either term, 3-0-0). Critical theories from Aristotle to Artaud. Pre- or corequisite: DRAMA 308 or consent of Department. Note: Required for BA (Honors) Drama students. Note: Not to be taken by students with credit in DRAMA 405 and 508.

DRAMA 307 Studies in Drama I
★3 *(fi 6)* (either term, 0-6L-0). Prerequisite: consent of Department.

DRAMA 308 The Modernist Stage
★3 *(fi 6)* (first term, 3-0-0). Theatre from 19th century Realism to 20th century Absurdism. Note: Required for BA (Honors) Drama students. Note: Not to be taken by students with credit in DRAMA 408.

L DRAMA 325 Creative Process and the Theatre Artist
★3 *(fi 6)* (either term, 0-4L-0). Theory and practice of the creative process of theatre arts emphasizing its interdisciplinary nature and the development of human resources. Prerequisite: DRAMA 149 or 150 or consent of Department.

L DRAMA 327 Community-Based Theatre
★3 *(fi 6)* (either term, 0-4L-0). A study of the theory, practice and development of popular, community and collective theatre. Recommended for students who intend to enrol in DRAMA 459.

DRAMA 331 Movement and Physical Theatre
★3 *(fi 6)* (either term, 0-6L-0). An introduction to the use of improvisational movement in the creation of physical theatre. Prerequisite: DRAMA 149 or 150 or consent of the Department. Note: Priority will be given to BA Drama Majors, BA (Honors) Drama students, and BEd (Secondary) Drama Majors.

DRAMA 334 Beginning Movement
★6 *(fi 12)* (two term, 0-8L-0). Techniques in ballet and period style for the actor. Exploration of creative forms of movement and the physical self in characterization. Note: Restricted to BFA Acting. Not to be taken by students with credit in DRAMA 336 or 338.

DRAMA 335 Movement in Rehearsal and Performance
★2 *(fi 4)* (two term, 0-0-1). Restricted to BFA (Acting) students. This is a credit-fail course.

DRAMA 344 Voice and Speech
★6 *(fi 12)* (two term, 0-8L-0). Introduction to voice and speech improvement; oral interpretation; exploration of the voice for characterization; singing. Note: Restricted to BFA Acting students. Not to be taken by students with credit in DRAMA 346 or 348.

DRAMA 345 Speech in Rehearsal and Performance
★2 *(fi 4)* (two term, 0-0-1). Note: Restricted to BFA Acting students. This is a credit-fail course.

DRAMA 355 Acting in Rehearsal and Performance
★2 *(fi 4)* (two term, 0-0-3). Note: Restricted to BFA Acting students.

DRAMA 356 Beginning Acting Technique I
★3 *(fi 6)* (first term, 0-10L-0). Development of the self as the fundamental instrument of the actor. Introduction to script analysis and scene study. Note: Restricted to BFA (Acting) students.

DRAMA 357 Scene Study II
★3 *(fi 6)* (either term, 0-6L-0). Acting exercises based on the study of plays emphasizing complexity of language and characterization. Prerequisites: DRAMA 102 or 103, and 240 and 257, and a Theatre History course from the Department of Drama course listings; and/or consent of Department. Note: Not to be taken by students with credit in DRAMA 453.

DRAMA 358 Beginning Acting Technique II
★3 *(fi 6)* (second term, 0-10L-0). Script analysis, characterization, and the laboratory exploration of scenes and/or plays drawn from Realism. Prerequisite: DRAMA 356. Note: Restricted to BFA (Acting) students.

DRAMA 361 Playwriting
★3 *(fi 6)* (first term, 0-6L-0). Study of and practice in the creation of a play for the theatre. Prerequisite: DRAMA 101 or one of DRAMA 102, 103, 149, or 150 or consent of Department. Note: Not to be taken by students with credit in DRAMA 360 or 407 in playwriting.

L DRAMA 383 Introduction to Directing
★3 *(fi 6)* (either term, 0-6L-0). Fundamentals of directing explored through practical exercises. Prerequisites: One of DRAMA 257, 370, 378 and/or consent of Department. Note: Priority given to BA Drama Majors, BA (Honors) Drama students, BEd (Secondary) Drama Majors, and BFA (Theatre Design; Technical Theatre; Stage Management) students.

DRAMA 390 Production Crew I
★3 *(fi 6)* (variable, 0-8L-0). Production experience in the preparation for and the running of a production for performance. Note: Restricted to BFA (Technical Theatre) students.

L DRAMA 391 Production Lab I
★3 *(fi 6)* (either term, 0-8L-0). Technical theatre practice. Preparation and running of the production aspects of Departmental plays. Prerequisite: DRAMA 279 or consent of Department. Note: Not to be taken by students with credit in DRAMA 191.

DRAMA 392 Production Lab II
★3 *(fi 6)* (variable, 0-0-6). Production experience in stage managing and/or technical theatre with qualified technical experts. Prerequisites: DRAMA 191, 391, and/or consent of Department.

DRAMA 393 Production Lab II B
★2 *(fi 4)* (first term, 0-0-2). Production organization; experience in running of a play in performance. Restricted to BFA (Acting) students. A required non-credit course.

DRAMA 394 Production Techniques - Sound
★3 *(fi 6)* (second term, 0-6L-0). Theory and practical application of audio equipment and sound design for the theatre. Note: Restricted to BFA Drama (Technical Theatre) students.

DRAMA 396 Stage Management I
★6 *(fi 12)* (two term, 0-6L-0). Introduction to the fundamentals of stage management addressing the preparation, rehearsal, and running stages of production. Note: Restricted to BFA (Technical Theatre: Stage Management) students.

DRAMA 397 Stagecraft
★6 *(fi 12)* (two term, 0-9L-0). The study of theatrical production techniques, construction, and mechanics. Note: Restricted to BFA (Technical Theatre: Technical Production) students.

DRAMA 399 Explorations in Acting I
★3 *(fi 6)* (two term, 0-3L-0). Exploration of dramatic text using exercises devoted to the coordination of the actor's voice, speech and movement. Restricted to BFA (Acting) students. Course grading criterion is in terms of 'credit/non-credit' only.

DRAMA 401 Research and Critical Writing Skills
★3 *(fi 6)* (first term, 0-3L-0). Prerequisite: DRAMA 306. Note: Required for BA (Honors) students.

DRAMA 402 Tutorial Fourth-Year Honors Essay
★3 *(fi 6)* (second term, unassigned). Prerequisite: DRAMA 401. Note: Not to be taken by students with credit in DRAMA 505.

DRAMA 406 Contemporary Approaches to Dramatic and Theatrical Theories
★3 *(fi 6)* (either term, 3-0-0). Modernist to contemporary theories applied to dramatic texts in performance. Prerequisite: consent of Department. Note: Required for BA (Honors) Drama students. Not to be taken by students with credit in DRAMA 503 and 509.

L DRAMA 407 Studies in Drama II
★3 *(fi 6)* (either term, 0-6L-0). Prerequisite: consent of Department.

DRAMA 409 Contemporary Theatre
★3 *(fi 6)* (second term, 3-0-0). Exploration of issues and trends of theatre movements which form the mosaic of contemporary theatre. Prerequisite: consent of Department.

DRAMA 434 Theatre Movement
★6 *(fi 12)* (two term, 0-8L-0). Studies of, and projects in styles of movement and dance, both period and contemporary. Prerequisite: DRAMA 334. Note: Restricted to BFA Acting students. Not to be taken by students with credit in DRAMA 436 or 438.

DRAMA 435 Movement in Rehearsal and Performance
★2 *(fi 4)* (two term, 0-0-2). Note: Restricted to BFA Acting students. This is a credit-fail course.

DRAMA 444 Advanced Voice and Speech
★6 *(fi 12)* (two term, 0-6.5L-0). Extension of the voice; sight reading, oral interpretation of period dramatic forms; singing. Prerequisite: DRAMA 344. Note: Restricted to BFA Acting students. Not to be taken by students with credit in DRAMA 446 or 448.

DRAMA 445 Speech in Rehearsal and Performance
★2 *(fi 4)* (two term, 0-0-2). Note: Restricted to BFA (Acting) students. This is a credit-fail course.

DRAMA 451 Make-up for the Stage
★2 *(fi 4)* (first term, 0-3L-0). Practice in use of basic and special materials in creating character make-up for the stage. Note: Restricted to BFA (Drama) and BMus (Voice) students. Not open to students with credit in DRAMA 351 or 551. This is a credit/fail course.

DRAMA 454 Performance Creation
★3 *(fi 6)* (either term, 0-6L-0). Exploration, practice, and experimentation in

performer-created theatre. Prerequisite: DRAMA 259 and 391 and/or consent of Department.

DRAMA 455 Acting in Rehearsal and Performance
★3 *(fi 6)* (two term, 0-4L-0). Note: Restricted to BFA Acting students.

DRAMA 456 Advanced Acting Technique I
★3 *(fi 6)* (first term, 0-10L-0). Studies in characterization leading to laboratory performance. Prerequisite: DRAMA 358. Note: Restricted to BFA (Acting) students.

DRAMA 457 Production/Performance
★6 *(fi 12)* (either term, 0-8L-0). Research, rehearsal, design, staging and presentation of a play by an acting ensemble. Prerequisites: DRAMA 357 and 391, a Theatre History course from the Department of Drama course listings, and/or consent of Department.

DRAMA 458 Advanced Acting Technique II
★3 *(fi 6)* (second term, 0-10L-0). Study of, and practice in, the main period styles of acting. Prerequisite: DRAMA 456. Note: Restricted to BFA (Acting) students.

L DRAMA 459 Collective Creation
★3 *(fi 6)* (either term, 0-6L-0). The collaborative preparation and presentation of performer-created theatre within a social context. Prerequisite: DRAMA 259 and/or consent of Department. DRAMA 327 is recommended.

DRAMA 461 Script Writing
★3 *(fi 6)* (second term, 0-6L-0). The theory and practice of writing for dramatic media: theatre, film, radio, or television. Prerequisite: DRAMA 361 and consent of Department. Note: Not to be taken by students with credit in DRAMA 460.

DRAMA 483 Elements of Directing
★3 *(fi 6)* (either term, 0-6L-0). Developing the director's creative use of the elements of directing through practical exercises in scripted scenes. Prerequisites: DRAMA 102 or 103, 383 and 391, and/or consent of Department.

DRAMA 490 Production Crew II
★3 *(fi 6)* (variable, 0-8L-0). Production experience in the preparation for and/or the running of a production for performance. Prerequisite: DRAMA 390. Note: Restricted to BFA (Technical Theatre) students.

DRAMA 492 Running Crew Projects
★3 *(fi 6)* (either term, 0-0-6). Production organization: experience in preparing and running of a play in performance. Prerequisites: DRAMA 191, or 391 and/or consent of Department.

DRAMA 495 Management-Practices for Technical Theatre
★3 *(fi 6)* (either term, 4-0-0). Administrative practice directed toward production shop facilities and personnel. Note: Restricted to BFA (Technical Theatre) students.

DRAMA 496 Stage Management II
★6 *(fi 12)* (two term, 0-6L-0). Study of stage management practice as it applies to different types of production (i.e., Children's Theatre, Legitimate Theatre, Collective, Musical Theatre, Opera, Ballet, etc.). Prerequisite: DRAMA 396. Note: Restricted to BFA (Technical Theatre: Stage Management) students. Repeatable (to be taken two years in succession).

DRAMA 497 Workshops in Technical Theatre
★6 *(fi 12)* (two term, 0-10L-0). Technical production techniques and practice (i.e., health and safety, rigging, flying, rolling stock and tracked stages, hydraulics, pneumatics, plastics and metal fabrication, etc.). Prerequisite: DRAMA 397. Note: Restricted to BFA (Technical Theatre: Technical Production) students. Repeatable (to be taken two years in succession).

DRAMA 499 Explorations in Acting II
★3 *(fi 6)* (two term, 0-3L-0). Exploration of dramatic text related to period style with emphasis on characterization, and special problems. Prerequisite: DRAMA 399. Restricted to BFA (Acting) students. Course grading criterion is in terms of 'credit/no credit' only.

DRAMA 505 Tutorial Fourth-Year Honors Essay
★6 *(fi 12)* (two term, unassigned). Preparation of the Honors essay under the guidance of a member of the Department.

DRAMA 507 Senior Projects
★3 *(fi 6)* (either term, 0-5L-0). Prerequisite: consent of Department.

DRAMA 534 Advanced Movement
★6 *(fi 12)* (two term, 0-6L-0). Instruction and projects for individual growth in movement expression. Prerequisite: DRAMA 438. Note: Restricted to BFA (Drama) students.

DRAMA 535 Movement in Rehearsal and Performance
★3 *(fi 6)* (two term, 0-0-3). Note: Restricted to BFA Acting students. This is a credit-fail course.

DRAMA 544 Dialects and Accents/Language Styles
★6 *(fi 12)* (two term, 0-7L-0). Survey of dialects and accents; intensive practice in representative examples from the British Isles, Europe and North America; tutorial instruction to suit the actor's vocal needs; singing. Prerequisite: DRAMA 448. Note: Restricted to BFA (Drama) students.

DRAMA 545 Speech in Rehearsal and Performance
★3 *(fi 6)* (two term, 0-0-3). Note: Restricted to BFA Acting students. This is a credit-fail course.

DRAMA 554 Rehearsal and Performance
★6 *(fi 12)* (two term, 0-25L-0). Rehearsal and performance of roles in public production. Workshops in acting for film and radio. Prerequisite: DRAMA 458. Note: Restricted to BFA (Acting) students.

DRAMA 577 Special Projects
★3 *(fi 6)* (either term, 0-6L-0). Special projects in design and production. Formerly part of DRAMA 507.

DRAMA 590 Production Crew III
★6 *(fi 12)* (two term, 0-15L-0). Production experience in preparing and/or running of a production for performance. Prerequisite: DRAMA 490. Note: Restricted to BFA (Technical Theatre) students. Repeatable.

DRAMA 595 Professional and Critical Orientation
★0 *(fi 4)* (two term, 2-0-0). A non-credit course required for graduation. Note: Restricted to BFA (Drama) students.

DRAMA 599 Explorations in Acting III
★2 *(fi 4)* (either term, 0-2L-0). Prerequisite: DRAMA 499. Restricted to BFA (Acting) students. Course grading criterion is in terms of 'credit/no credit' only.

Graduate Courses

DRAMA 601 Methods and Tools of Research
★3 *(fi 6)* (either term, 0-3L-0).

DRAMA 602 Theatre Historiographies
★3 *(fi 6)* (either term, 0-3s-0). Critical approaches to historical research.

DRAMA 605 Special Projects in Theatre
★3 *(fi 6)* (variable, 0-3L-0). Prerequisite: consent of Department.

DRAMA 607 Dramaturgy I
★3 *(fi 6)* (variable, 0-3s-0).

DRAMA 608 Historical Approaches to Dramatic and Theatrical Critical Theories
★3 *(fi 6)* (either term, 0-3s-0). An in-depth analysis of selected theories of aesthetics, drama and theatre, from Aristotle to Modernism.

DRAMA 609 Contemporary Approaches to Dramatic and Theatrical Critical Theories
★3 *(fi 6)* (either term, 0-3s-0). An in-depth analysis of selected contemporary theories of aesthetics, drama and theatre, from Structuralism to the present.

DRAMA 617 Dramaturgy II
★3 *(fi 6)* (variable, 0-9L-0). Practical studies in dramaturgy. Prerequisites: DRAMA 607 and/or consent of Department.

DRAMA 621 Research Seminar I
★3 *(fi 6)* (either term, 0-3s-0). Selected topics in Theory and Criticism.

DRAMA 622 Research Seminar II
★3 *(fi 6)* (either term, 0-3s-0). Selected topics in Theory and Criticism.

DRAMA 623 Research Seminar III
★3 *(fi 6)* (either term, 0-3s-0). Selected topics in Theatre History and Theatrical Theory.

DRAMA 624 Research Seminar IV
★3 *(fi 6)* (either term, 0-3s-0). Selected topics in Theatre History and Theatrical Theory.

DRAMA 625 Research in Canadian Drama I
★3 *(fi 6)* (either term, 0-3s-0). Research in selected topics related to Canadian Drama.

DRAMA 626 Research in Canadian Drama II
★3 *(fi 6)* (either term, 0-3s-0). Research in selected topics related to Canadian Drama.

DRAMA 659 Popular Theatre: Theory and Methodology
★3 *(fi 6)* (either term, 0-9L-0). This course will examine the principles on which popular theatre rests, the objectives of popular theatre, various approaches to popular theatre, and evaluation of popular theatre. Students will examine these topics through a mix of academic study, practical introduction of specific popular theatre techniques, and an experience in a popular theatre process. Prerequisite: consent of Department.

DRAMA 680 Styles of Directing
★6 *(fi 12)* (two term, 0-3s-6). Note: Restricted to MFA (Drama) students.

DRAMA 681 Advanced Projects in Directing
★6 *(fi 12)* (two term, 0-3s-6). Note: Restricted to MFA (Drama) students.

DRAMA 690 Topics in Applied Theatre Aesthetics
★3 *(fi 6)* (either term, 0-3s-0). Prerequisite: consent of Department.