### Course Listings

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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. Designed 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. **O**—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 **O6**. A course that runs for only one term (i.e., Fall: from September to December, or Winter: from January through April) is usually weighted **O3**. Certain courses are offered over Fall/Winter or Spring/Summer, or in one term, with weights of **O1**, **O2**, and **O4**. 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 **O0**, or are marked as "Cred".

- 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. **ft**—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 **O3** normally has **ft6**. 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 hour(s), 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 lectures, 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.

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

(b) **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**—This indicates a course available to students of Open Studies. This 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 1111A and 1111B).

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
In Winter Term
ABCD 101A Lec C3 and ABCD 101A Lab C8, 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.
ACCTG 412 Financial Reporting for Managers and Analysts
13 (0-0) (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
13 (0-0) (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 condensed exam for ACCTG 414.

ACCTG 415 Intermediate Financial Accounting II
13 (0-0) (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 B in ACCTG 414.

ACCTG 416 Accounting Theory and Current Issues
13 (0-0) (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. Prerequisite: 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
13 (0-0) (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
13 (0-0) (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 MGTISC 312. There is a consolidated exam for ACCTG 424.

ACCTG 426 Management Control Systems
13 (0-0) (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 per entity, management decision making, 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
13 (0-0) (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
13 (0-0) (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: determination of corporate valuation, income measurement 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
13 (0-0) (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 assurance industry, e-commerce and assurance 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 accountant; 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 HN 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) (either term, 3-0-0). Preparation of the Honors essay required for students in the Accounting Honors Program. Prerequisites: consent 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 by the accounting industry, e-commerce and accounting controls, and new assurance services. Prerequisites: ACCTG 311 and 322.

ACCTG 490 Accounting Competition Part I  
1.5 (fi 3) (either term, 0.5-0.5-0). 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, 0.5-0.5-0). 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 619 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 668 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 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, and decisions made by managers, investors, 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. Prerequisite: 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 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). An introduction to 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-economic-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) (limit 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 synthétique 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 contractual, et de la fraude. 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, analyse des débiteurs et créanciers, des flux de trésorerie, des flux de trésorerie. Préalable(s): ECON 101/102. Note: Ce cours n’est pas accessible aux étudiants ayant ou postulant des crédits pour ADMI 311.

ADMI 322 Gestion et méthodes de contrôle
★3 (fi 6) (l’un ou l’autre semestre, 3-0-0). Objectifs d’une entreprise, concept de gestion d’affaires, dimension de contrôle, analyse 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). Étudier les décisions prises par les directions d’entreprises et les facteurs qui contribuent à ces décisions. Préalable(s): FIN 301, MARK 301, ORG A 201. Note: Ce cours n’est pas accessible aux étudiants ayant ou postulant des crédits pour ADMI 441.

ADMI 444 Commerce international
★3 (fi 6) (l’un ou l’autre semestre, 3-0-0). Problèmes et opportunités lors d’une entreprise opérant dans plus d’un pays: le choix à faire entre opérer à l’étranger, l’exportation et l’utilisation de licences; nature et causes de l’émigration 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 transfert 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 (either term, 3-0-0). Applications of economic concepts to problems of economic principles to problems of business and economic analysis. The concept of competition, market structure, and market behavior is examined. Emphasis is given to the analysis of market equilibrium and the application of microeconomic principles to business decision-making. Credit will only be given for one of ADMI 445 and BUEC 445.

ADMI 463 L'énergie et l'environnement: Structure industrielle, performance et défis

3 (either term, 3-0-0). Organization and functioning of the energy and environmental sectors, including the role of government policy in shaping industry performance. Emphasis is given to the analysis of the energy and environmental sectors, including the role of government policy in shaping industry performance. Credit will only be given for one of ADMI 463 and BUEC 463.

Course Listings

**221.4 Agricultural and Resource Economics, AREC**

Department of Rural Economy
Faculty of Agriculture, Forestry, and Home Economics
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 (FUEHC), Interdisciplinary Undergraduate Courses (IN1 U) and Rural Sociology (R SOC) listings for related courses.

Undergraduate Courses

- **AREC 200 Current Economic Issues for Agriculture and Food**
  3 (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.

- **AREC 214 Applications of Linear Models to Food, Resources and the Environment**
  3 (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 214.

- **AREC 313 Statistical Analysis**
  3 (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.

- **AREC 323 Introduction to Management for Agri-Food, Environmental, and Forestry Businesses**
  3 (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 HN 301 or MANK 301.

- **AREC 333 Economics of Production and Resource Management**
  3 (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 management decision-making. Prerequisites: One of AREC 200, AG EC 200, ECON 281, IN1 D 365 or AREC 365 or equivalent. Credit will only be given for one of AREC 333 and AG EC 333.

- **AREC 365 Natural Resource Economics**
  3 (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.

- **AREC 384 Food Market Analysis**
  3 (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.

- **AREC 400 Special Topics**
  3 (either term, 3-0-3). 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 (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 ENVCS 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 (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.

- **AREC 433 Financial Management in Resource Industries**
  3 (either term, 0-3s-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, IN1 D 365 or AREC 365, HN 301 or equivalent. Credit will only be given for one of AREC 433 and AG EC 433.

- **AREC 450 Economic and Social Impact Assessment**
  3 (either term, 3-0-0). Examination of the theory and application of economic and social impact assessment methods with an emphasis 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, H 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 (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 IN1 D 465.

- **AREC 473 Food and Agricultural Policies**
  3 (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 475 and AG EC 473.

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.

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 survival of competitive versus investor-owned firms; and market structures on market conduct and performance. Prerequisite: One of AREC 200, AG EC 200, ECON 281 or consent of Department. Credit will only be given for one of AREC 482 and AG EC 482.

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 executive strategies; planning, implementing, managing and evaluating strategies; technology and competitiveness; assessing opportunities and threats; vertical and horizontal integration of agri-food and resource businesses. Prerequisite: One of INT D 365, ECON 281 or consent of Department.

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, ECON 281 or AREC 365 or equivalent. Credit will only be given for one of AREC 485 and AG EC 485.

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 market. 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 agriculture, 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 ANLED 487 and AG EC 487.

Graduate Courses

Notes
1. See also INT D 585 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.

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. Applied demand analysis, demand analysis, analysis of consumer behavior 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.

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 by given for one of AREC 513 and AG EC 513.

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.

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 316) and (AREC 502 or AG EC 502) recommended. Credit will only be given for one of AREC 533 and AG EC 533.

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. Costs 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 316) and (AREC 433, AG EC 433 or FIN 301) recommended. Credit will only be given for one of AREC 534 and AG EC 534.

AREC 550 Economic and Social Impact Assessment ★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 survival of competitive versus investor-owned firms; and market structures on market conduct and performance. 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 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.

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 policy. Prerequisite: consent of Instructor; (AREC 313 or AG EC 416) and (ANLED 502 or AG EC 502) recommended. Credit will only be given for one of AREC 573 and AG EC 573.

AREC 575 Agricultural Development Countries ★3 (fi 6) (either term, 3-0-0). The 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 ANLED 575 and AG EC 575.

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 (ANLED 502 or AG EC 502) recommended. Credit will only be given for one of AREC 584 and AG EC 584.

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, 3-0-0). 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.

Note: See also Animal Science (AN SC), Environmental and Conservation Sciences (ENCS), Interdisciplinary (INT D), Nutrition (NUTR), Nutrition and Food Science (NU HS), Plant Science (PL SC), Renewable Resources (RENSC) and Soil Science (SOILS) for related courses.
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 (or 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). Headings 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: MICH 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 terminated 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 37.

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 in confinement, 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; determinations 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 the Fall. 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, 3-0-6). 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 toxicological 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 (or 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 NUH 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 383) 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, feeding programs, and feed ingredients used for swine. Feeding 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. Feeding 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 AN 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 NUH 488, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 568, NUTR 488 and NU FS 488. Prerequisite: NUH 301 (or 363). Corequisite: NUH 302.
AFNS 570 Experimental Procedures in Nutrition and Metabolism

3 (fi 6) (either term, 0-0-6). Current methodologies in nutrition and metabolism. Prerequisites: NUH 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 improved 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: ENLS 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. Offered in alternate years commencing 2001/02. Prerequisite: ENLS 356; ENCS 406 strongly recommended.

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 478, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 578, NUTR 478, and NU FS 478. Prerequisite: NU FS 468 or NUH 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 and labs 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: NUH 302. NUH 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 486, with additional assignments and evaluation appropriate to graduate studies. Credit will only be given for one of AFNS 580 and NU FS 480. Prerequisite: MICR 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 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, 0-3-0). 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 6) (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 methodology of research, the thesis and grant writing, poster and lecture 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 nutrient utilization. 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: *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

**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.

**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.

**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.

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

**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.

**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 301 or 401.

**ANAT 401 Human Neuroanatomy**
*3 (fi 6)* (second term, 3-0-0). 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.

**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.

**ANAT 403 The Human Body**
*3 (fi 6)* (first term, 3-0-0). 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.

**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.

**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.

**ANAT 497 Research Project**
*3 (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

**ANAT 600 Medical Gross Anatomy**
*3 (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.

**ANAT 601 Medical Neuroanatomy**
*3 (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.

**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.

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

**ANAT 625 Selected Topics in Advanced Human Anatomy**
*3 (fi 6)* ( either term, 0-0-3). An in-depth, supervised, self-directed study focusing 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.

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

**ANAT 625 Selected Topics in Advanced Human Anatomy**
*3 (fi 6)* (either term, 0-0-3). An in-depth, supervised, self-directed study focusing on topics relevant to the anatomical disciplines. Credit may be obtained for this course more than once. Prerequisite: consent of Division.

**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. Prerequisite: consent of Division.

**ANAT 520 Formations expérimentales à la dynamique de groupe**
*3 (fi 6)* (either term, 1-2s-6). 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) Préalable pour le cours au niveau 200: ANGL 101.

Undergraduate Courses

ANGL 101 Critical Reading and Writing  
★6 (fi 12) (two term, 3-0-3). 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. Atteinte 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: Ancienement 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 attestation 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 (RHN R) for related courses.

Undergraduate Courses

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.

AN SC 200 Principles of Animal Agriculture  

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.

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 homeostasis 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.

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.

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 and fat. Livestock and carcass appraisal. Prerequisite: AN SC 200 or ★3 in university level biology.

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.

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.

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.

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.

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.

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.

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 ZUUL 343 or equivalent.

AN SC 420 Carcass and Meat Quality  
★3 (fi 6) (second term, 3-0-2). 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 to a poultryWeek. 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: AN SC 200 or ★3 university-level biology.

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 diets for beef and 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 AN SC 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 extensively. Graduate students may not register for credit (see AFNS 562). Credit will only be given for one of ANSC 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 ANSC 515, 563 and AN SC 463. Prerequisite: AN SC 260 or ★3 NUTR. Corequisite: AN SC 311.
ANTHE 101 Introductory Anthropology
(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

ANTHR 101 Introductory Anthropology
(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.

221.15 Anthropologie, ANTHE Faculté Saint-Jean

Course de 1er cycle

ANTHE 101 Introduction à l’anthropologie
(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.

ANTHE 110 Ethnologie du sexe, de l’âge et du pouvoir
(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.

ANTHE 207 Introduction à l’anthropologie sociale et culturelle
(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.

ANTHE 208 Introduction à l’anthropologie linguistique
(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.

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

ANTHR 101 Introductory Anthropology
(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.

ANTHR 110 Gender, Age, and Culture
(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.

ANTHR 207 Introduction to Social and Cultural Anthropology
(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.

ANTHR 208 Introduction to Linguistic Anthropology
(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.

ANTHR 209 Introduction to Physical Anthropology
(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.

ANTHR 219 World Prefhistory
(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.

ANTHR 230 Anthropology of Science, Technology, and Environment
(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.

ANTHR 246 Peoples and Cultures of the Circumpolar Region
(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.
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.

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

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.

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.

ANTHR 264 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.

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.

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.

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.

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.

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.

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 anthropolical 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 267 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, 2-1-0). 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, objectivity, and culture-bound epistemologies. Prerequisite: ANTHR 230, or one of 206 to 209, or consent of Department. Offered in alternate years.

ANTHR 335 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 490. Offered in alternate years.

ANTHR 336 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 337 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 338 Topics in Physical Anthropology or Archaeology
3 (fi 6) (either term, 0-3s-0). Prerequisite: consent of Department.

ANTHR 339 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
3 (fi 6) (Spring/Summer, 3-0-3). Inclusion 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 260 or equivalent, and consent of Department.

ANTHR 397 Anthropological Field Training
3 (fi 6) (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
⭐(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
⭐(fi 6) (either term, 0-3s-0). Discussion of issues in methodology and field methods. Restricted to senior undergraduate students. Prerequisite: ANTHHR 207 or consent of Department. Offered in alternate years.

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

ANTHR 408 Methods in Linguistic Anthropology
⭐(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
⭐(fi 6) (either term, 3-0-0). Major theoretical trends in social and cultural anthropology in the nineteenth and twentieth centuries. Prerequisites: ANTHHR 207 or 208 and a 300- or 400-level anthropology course, or consent of Department.

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

ANTHR 417 Anthropology of Modernity
⭐(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: ANTHHR 207 or 208 and a 300- or 400-level ANTHHR course, or consent of Department. Offered in alternate years.

ANTHR 422 Anthropological Approaches to Verbal Art
⭐(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: ANTHHR 207 or 208 or consent of Department. Offered in alternate years.

ANTHR 430 Anthropological Approaches to Symbolism
⭐(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: ANTHHR 207 or 320 or consent of Department. Offered in alternate years.

ANTHR 433 The Ethnographic Study of Meaning
⭐(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: ANTHHR 207 or 208 and a 300- or 400-level anthropology course, or consent of Department. Offered in alternate years.

ANTHR 436 Ethnography of Communication
⭐(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 ANTHHR, or consent of Department. Offered in alternate years.

ANTHR 437 Language, Ethnicity, and Nationalism
⭐(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: ANTHHR 207, or 208 or consent of Department. Offered in alternate years.

ANTHR 438 Language Use and Issues in Northern Canada
⭐(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: ANTHHR 208 or any other 200-level ANTHHR course, or consent of Department. Offered in alternate years.

ANTHR 441 Archaeometry
⭐(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: ANTHHR 206 or consent of Department. Offered in alternate years.

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

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

ANTHR 450 Honors Thesis
⭐(fi 6) (either term, variable). Preparation of the BA Honors thesis under the supervision of an individual faculty member. Prerequisites: ANTHHR 400 and consent of Department. Note: open to students with credit in ANTHHR 499.

ANTHR 463 The Origins of Food Production
⭐(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: ANTHHR 206 or consent of Department. Offered in alternate years.

ANTHR 471 Readings in Anthropology
⭐(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
⭐(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
⭐(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: ANTHHR 207 or 250 or consent of Department. Offered in alternate years.

ANTHR 475 Advanced Topics in the Anthropology of Japan
⭐(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
⭐(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 Archaeology
⭐(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: ANTHHR 206 and a 300- or 400-level anthropology course, or consent of Instructor. Offered in alternate years.

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

ANTHR 484 Topics in Archaeology and/or Physical Anthropology
⭐(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
⭐(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
⭐(fi 6) (either term, 3-0-3). 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
⭐(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
⭐(fi 6) (either term, 3-0-3). Prerequisite: consent of Department. Offered in alternate years.

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

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

ANTHR 491 Stone Tools
⭐(fi 6) (either term, 0-3-0). A methodological and theoretical introduction to the analysis of stone tools. Prerequisites: ANTHHR 206 and one other 400-level course in Anthropology or consent of Department. Offered in alternate years.
ANTHR 483 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 398 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 methods 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, 0-3-3). 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 586 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, 0-3-0). 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. 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

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 I
★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.

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

Course Listings

U N I V E R S I T Y  O F  A L B E R T A

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 136 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). Studio-based exploration of the principles, concepts, and techniques of painting. Projects based on observation with reference to both historical and contemporary examples. Prerequisites: ART 134 and DES 135 or ART 136 and DES 136 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). Further study of painting the figure with emphasis on working from the life model. Prerequisites: ART 310, 311, and ART 310 and prerequisite or corequisite: ART 311, and consent of Department. Note: Not open to students with credit in ART 313.

ART 312 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. Prerequisites: 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). Study of the principles and techniques of painting with emphasis on working from the life model. Prerequisites: ART 310, 311, and 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). Further study of the principles and technical applications of printmaking with an emphasis on lithography and etching. Prerequisites: ART 134 and DES 135 or ART 136 and DES 136 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 printmaking with an emphasis on lithography and etching. Prerequisites: ART 134 and DES 135 or ART 136 and DES 136 and consent of Department.

ART 337 Special Projects in Studio Disciplines
★3 (fi 6) (either 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 136 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. Normally offered in Spring/Summer. Prerequisites: ART 134 and DES 135 or ART 136 and DES 138 and consent of Department.

ART 339 Special Projects in Drawing
★3 (fi 6) (either term, 0-6L-0). Further study of principles and techniques of drawing with emphasis on working from the life model. Prerequisites: ART 134 and DES 135 or ART 136 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 working from the life model. Prerequisites: ART 134 and DES 135 or ART 136 and DES 136 and consent of Department.

ART 360 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 136 and consent of Department. Corequisite: Normally ART 362, to be taken in the same academic year. Not open to students with credit in ART 361. Offered in Spring/Summer only. Prerequisites: ART 134 and DES 135, or ART 136 and DES 138 and consent of Department.

ART 361 Sculpture: Introductory Studies in Figurative Sculpture
★3 (fi 6) (first 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 361. Offered prior to 1992-93.

ART 362 Sculpture: Introductory Studies in Figurative Sculpture
★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 134, 135, and consent of Department. Corequisite: Normally ART 361, to be taken in the same academic year. Not open to students with credit in ART 361. Offered prior to 1992-93.

ART 363 Sculpture: Introductory Studies III
★3 (fi 12) (two term, 0-6L-0). Further study of advanced principles, concepts and techniques of painting, leading to self-initiated projects. Prerequisites: ART 134, 135, and consent of Department. Corequisite: Normally ART 361, to be taken in the same academic year. Not open to students with credit in ART 361. Offered prior to 1992-93.

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. Corequisite: Restricted to BFA and BDesign students. 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 advances principles, concepts and techniques of painting, leading to self-initiated projects. Prerequisites: ART 141 and consent of Department. Note: Not open to students with credit in ART 412.

ART 412 Painting: Intermediate Figure Studies I
★3 (fi 6) (first term, 0-6L-0). Further study in painting the figure with emphasis on working from the life model. Prerequisites: ART 411, 317, and consent of Department. Corequisite: Normally ART 410, and consent of Department. Note: Not open to students with credit in ART 414.

ART 414 Painting: Intermediate Figure Studies II
★3 (fi 6) (second term, 0-6L-0). Further study in painting the figure with emphasis on working from the life model. Prerequisites: ART 411, 317, and consent of Department. Corequisite: Normally ART 410, 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). Further study of the principles and technical applications of printmaking with 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 422. 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 (either 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 (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 (either 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 (either 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 (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 (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 (either 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 (either 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 (either 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 AH1 512.

**ART 511 Painting: Advanced Studies II**
★3 (second term, 0-6L-0). Individual directed study in a studio/workshop environment. Prerequisites: AH1 510 or 516 and/or consent of Department. Note: Not open to students with credit in AH1 512.

**ART 516 Painting: Advanced Studies III**
★3 (either term, 0-6L-0). Individual directed study in a studio/workshop environment. Prerequisites: AH1 410, 411 and consent of Department. Note: Not open to students with credit in AH1 513.

**ART 517 Painting: Advanced Studies IV**
★3 (either 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 AH1 514.

**ART 518 Painting: Advanced Figure Studies V**
★3 (either term, 0-6L-0). Individual directed study in a studio/workshop environment emphasizing the human figure as subject matter. Prerequisites: ART 410, 414, 419 and prerequisite or corequisite: ART 510 or 516 and/or consent of Department. Note: Not open to students with credit in AH1 514.

**ART 519 Painting: Advanced Figure Studies VI**
★3 (either term, 0-6L-0). Individual directed study in a studio/workshop environment emphasizing the human figure as subject matter. Prerequisites: AH1 510 or ART 414, 419 and one of ART 510, 516 and/or consent of Department. Note: Not open to students with credit in AH1 514.

**ART 522 Printmaking: Advanced Studies I**
★6 (either 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 (either 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 (either 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 (either 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 (either 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 (second 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 (second term, 0-6L-0). Normally offered in Spring/Summer. Prerequisites: AH1 439, or AH1 440 and 441, and consent of Department.

**ART 540 Drawing: Advanced Studies**
★3 (either term, 0-6L-0). Prerequisite: AH1 439, or AH1 440 and 441. Note: Restricted to BFA and BDesign students.

**ART 541 Drawing: Advanced Studies**
★3 (second term, 0-6L-0). Prerequisite: AH1 540. Not open to students with credit in AH1 540 (★6) offered before 1995/96.

**ART 550 Installation Art: Advanced Studies**
★3 (either term, 0-6L-0). Prerequisites: AH1 450 or 12 in 400-level AH1 courses, and consent of Department.

**ART 562 Sculpture: Advanced Studies I**
★6 (either term, 0-6L-0). Advanced studies in sculpture. Prerequisite: AH1 462 and/or consent of Department.

**ART 563 Sculpture: Advanced Studies II**
★6 (either 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 (either 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 (two term, 0-18L-0).

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

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

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

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

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

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

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

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

**221.19 Art dramatique, ADRAM**
Faculté Saint-Jean

**Cours de 1er cycle**

**ADRAM 101 Introduction à l’art théâtral**
★3 (l’an 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 théatre: de la conception à la réalisation. Analyses critiques de pièces auxquelles les étudiants assistent.

**ADRAM 103 Les procédés dramatiques**
★3 (l’an 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’improvisographie.
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. Œuvres 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 HANC 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 History 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, 6-3s-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, 0-3s-0). Supervised internships in an Edmonton area or other approved institution. Prerequisite: ART H 550, 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

**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.

ASTRU 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.

ASTRU 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.

ASTRU 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.

ASTRU 420 Upper Atmosphere and Space Physics

**3 (fi 6)** (either term, 3-0-0). Basic space plasma phenomena; 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.

ASTRU 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.

ASTRU 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 ASTHU 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.

BIUCH 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 or, 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 bioynthesis in plants; the integration and 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 glycolobiology; 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**

Prerequisites: BIOCH 200, CHEM 102, and 263. 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 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 530).

**BIOCH 330 Nucleic Acids and Molecular Biology**

Prerequisites: (fi 6) (either term, 3-0-0). Provides students with a comprehensive introduction to the biochemistry of nucleic acids. This course will cover the structure and function 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. This course may not be taken for credit if credit has already been obtained in BIOCH 203 or 205.

**BIOCH 401 Biochemistry Laboratory**

Prerequisites: BIOCH 320 and 330 with minimum grades of B-, and consent of Department.

**BIOCH 410 Signal Transduction and Metabolic Regulation**

Prerequisites: BIOCH 310 and 320 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).

**BIOCH 420 Protein Chemistry, Structure, and Function**

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 520).

**BIOCH 430 Chemistry of Eukaryotic Gene Expression**

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 530).

**BIOCH 441 Structure and Function of Biological Membranes**

Prerequisites: BIOCH 310 and 320 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 541).

**BIOCH 450 The Molecular Biology of Mammalian Viruses**

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 550).

**BIOCH 455 Biochemistry of Lipids and Lipoproteins**

Prerequisites: (fi 6) (third 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).

**BIOCH 460 Physical Biochemistry**

Prerequisites: (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 as 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 register for credit (see BIOCH 560).

**BIOCH 498 Advanced Laboratory**

Prerequisites: (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. Enrollment will be restricted 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**

Prerequisites: (fi 6) (second 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. Prerequisites: 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**

Prerequisites: (fi 6) (third 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**

Prerequisites: (fi 6) (third term, 3-0-0). 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**

Prerequisites: (fi 6) (third 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**

Prerequisites: (fi 6) (third 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 enzymeology, 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 441).

**BIOCH 550 The Molecular Biology of Mammalian Viruses**

Prerequisites: (fi 6) (third 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 onogenesis. 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 450).

**BIOCH 555 Biochemistry of Lipids and Lipoproteins**

Prerequisites: (fi 6) (third 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. 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 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 4)* (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 spectroscopy, diffusion 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. Prerequisite: 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 4)* (second term, 0-3s-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 4)* (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, 0-3s-0). This course is a journal club and discussion group in which current research topics on nucleic acids are discussed. Specific topics 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 4)* (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 topics 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.

**BIUCH 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.

**BIUCH 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**

**BIUCM 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 BIUCM 220.

**BIUCM 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): BIUCM 203. Note: Ce cours n’est pas accessible aux étudiants ayant ou postulant des crédits pour BIOCH 201.

**221.24 Biophysics, BIOIN**

Faculté Saint-Jean

**Department of Biological Sciences**

**Undergraduate Courses**

**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 ULENT 270. (Offered jointly by the Departments of Computing Science and Biological Sciences). [Biological Sciences].

**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 ULENT 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’année suivante, 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 génétique et à la biotechnologie. Préalable(s): Biologie 30 et Chimie 30.

**BIOLE 108 Les organismes et leur environnement**

*3 (fi 6)* (l’année suivante, 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 mycètes, de protistes, de plantes et d’animaux. Préalable(s): Biologie 30.

**BIOLE 201 Biologie cellulaire des eucaryotes**

*3 (fi 6)* (l’année suivante, 3-0-3). Une introduction à l’organisation cellulaire des eucaryotes.
de la cellule eucaryote. Détection de molécules spécifiques au niveau ultrastructuraux; structure et fonction de la membrane plasmique; rôle du cytosquelette dans le transport intra-cellulaire, la mitose et la cytokinésie; le système endomembranaire, le ciblage des protéines, l’endocytose et l’endocytose; structure et fonction du noyau; contrôle du cycle cellulaire et cancer. Préalable(s): BIOL 107. Préalable(s) ou concomitante(s): CHIM 161 ou 261. Note: Ce cours n’est pas accessible aux étudiants qui ont déjà obtenu un crédit pour CEL 201.


BIOL 315 Histoire et théorie de la biologie ★★ (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 influencant, et ce par rapport aux événements sociaux, historiques et culturels commandant 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.


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 (BIOL); 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

LI BIOL 107 Introduction to Cell Biology ★★ (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.

LI BIOL 108 Introduction to Biological Diversity ★★ (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 adaptions of plants, protists, fungi, animals and plants. 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 108 and 107 can be taken in either term.

LI BIOL 201 Eukaryotic Cellular Biology ★★ (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 and intracellular transport, mitosis, and cytokinésie; the endomembrane system, protein targeting, endocytosis 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 LI BIOL 207 Molecular Genetics and Heredity ★☆ (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 prokaryotes and eukaryotes. Prerequisite: BIOL 107.

L LI BIOL 208 Principles of Ecology ★☆ (fi 6) (either term, 3-1s-3). Ecology: 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. Example 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.

LI BIOL 299 Research Opportunity Program ★☆ 15.0 (fi 6) (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 190 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 a RUP position. Credit may be obtained twice.

L BIOL 314 Biology of Bryophytes ★☆ (fi 6) (either term, 3-0-3). Hornworts, liverworts and mosses (bryophytes) are hardy 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. BIU 205 and BIU 210 recommended. May not be taken for credit if credit already obtained in BOT 305.

LI BIOL 315 Biology: An Historical Perspective ★☆ (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 ★☆ (fi 6) (second 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.

L BIOL 330 Introduction to Biological Data ★☆ (fi 6) (either term, 3-0-3). Expands on prior introductions to the scientific method and encourages the planning involved in scientific research. Labs emphasize 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 ★☆ (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; population size, and the exchange of genetic material between populations and species. Prerequisites: BIOL 208; any one of MATH 113, 115 or 120; STAT 151.

L BIOL 332 Community Ecology ★☆ (fi 6) (second term, 3-0-3). 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 ★☆ (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.

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 morphologic 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.

BIOL 340 Global Biogeochemistry
3 (fi 6) (second term, 3-0-0). An introduction to biogeochemical cycles in the environment and the processes that govern the species flows 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. MCRB 265 strongly recommended.

BIOL 361 Marine Science
3 (fi 6) (second term, 3-0-0). An introduction to marine science and marine biology. Includes an overview 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 SCI). Prerequisite: ZOOL 250 or BIOL 208.

BIOL 364 Freshwater Ecology
3 (fi 6) (second term, 3-0-0). 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.

BIOL 366 Northern Ecology
3 (fi 6) (second term, 3-0-0). Studies 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.

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 biodiversity, 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.

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.

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 formation 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, biominification, 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-0). 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: GENE 1390. Not to be taken by students with credit in GENE 420, in addition, not available to students currently enrolled in GENE 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: WKEEP 942 or 943.

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: STA 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. Prerequisite: BOT 332, STAT 151, and any university MATH course. The laboratory component includes field trips and independent research projects. Offered in alternate years.

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 interactions of these interactions. The seminar component consists of weekly discussions of related literature. Prerequisite: BIOL 331 or BIUL 330 or ZOUL 322. 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 organisms; 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.

BIOL 451 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 eutrophication and eutrophication. Prerequisite: A 300-level Biological Sciences course (BIOL 364 recommended) and GS in University level Chemistry. Credit may be obtained for only one of ZOOL 464 and BIOL 446.

BIOL 456 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 ZOUL 468.

BIOL 470 Landscape Ecology
3 (fi 6) (second term, 3-0-0). 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 GS course is useful. Consent of instructor is required.

BIOL 471 Localized 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 project. Credit may be obtained more than once. Prerequisite: A 300-level Biological Sciences course and consent of the Department.

BIOL 485 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.

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.

BIOL 499 Research Project
3 (fi 6) (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:
BIOL 506 Systematics and Evolution Forum
(2 nd term, 0-2s-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
(2nd term, 3-0-0). 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
(2nd 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
(3rd term, 0-4-0). 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
(3rd term, 0-3-0). 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. Enrollment of students by consent of instructor. Normally offered in alternate years.

BIOL 560 Current Problems in Ecology
(2nd term, 0-2s-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
(3rd 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
(2nd 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
(1st 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
(2nd 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
(1st term, 0-2s-0). Credit may be obtained more than once.

BIOL 632 Advanced Techniques in Biology
(2nd 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
(1st 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 512 and 540 which may be taken as courses in this discipline.

Undergraduate Courses

BME 210 Elementary Human Anatomy and Physiology
(3rd 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.

BME 310 Introduction to Biomedical Engineering and Biomedical Systems Modelling
(3rd 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

BME 513 Imaging Methods in Medicine
(2nd 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
(2nd 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: 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
(2nd term, 3-0-0). Individual sections covering such topics as signal processing and rehabilitation engineering. Prerequisite: consent of Instructor.

BME 541 Biomaterials in Medicine
(1st 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.

BME 553 Rehabilitation Engineering: Assisted Movement after Injury
(2nd 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, neuromuscular 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: BMT 210, 310 and consent of instructor.

**BME 555 Anatomy and Physiology for Engineers**

★3 (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 (6) (second term, 3-0). 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, imaging techniques for achieving specific types of contrast, image artifacts, and typical applications. Prerequisite: consent of Instructor.

**BME 579 Topics in Medical Physics**

★3 (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 (6) (either term, 0-0-0). Practical application of science to problems in health care; involves research 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, 0-12/0-0). Series of seminars exposing graduate students to the various areas of research and providing a forum for research 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 (6) (either term, 3-0-0). Prerequisite: consent of Department.

**BME 675 Magnetic Resonance in Biology and Medicine**

★3 (6) (first term, 3-0-0). Physiological and functional aspects of imaging. Emphasis on 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 (6) (either term, 3-0-0). Prerequisite: consent of Department.

### 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 (ZOO).

(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

**BUT 205 Fundamentals of Plant Biology**

★3 (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.

**BUT 210 Biology of Land Plants**

★3 (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.

**BUT 240 Whole Plant Physiology**

★3 (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.

**BUT 303 Plant Development**

★3 (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 and development. Emphasis in throughout the course will be on current research using developmental mutants. Prerequisites: BIOL 201 and 207; one of BUJ 205, 210 or 240 strongly recommended.

**BUT 306 Biology of the Fungi**

★3 (6) (second term, 3-0-3). The kingdoms 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, particularly as it pertains to biomedical engineering and bioinstrumentation. Prerequisites: BIOL 108 and a 200-level Biological Sciences course. BUT 205 recommended.

**BUT 308 Plant Anatomy**

★3 (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. BUT 205 recommended. May not be taken for credit if credit already obtained in BUT 209 or 309.

**BUT 310 Morphology and Evolution of Seed Plants**

★3 (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, Uroscale and Angiosperms) in terms of a much greater fossil record. Prerequisite: BUT 210 or consent of Instructor. BUT 205 recommended. Offered in odd-numbered years.

**BUT 314 Biology of Bryophytes**

★3 (6) (first term, 3-0-3). Hornworts, liverworts and mosses (bryophytes) 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. BUT 205 and 210 recommended. May not be taken for credit if credit already obtained in BUT 305.

**BUT 321 Flowering Plants**

★3 (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. BUT 205 recommended. May not be taken for credit if credit already obtained in BUT 220 or 320.

**BUT 322 Field Botany**

★3 (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 covered. 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. (BUT 321 is strongly recommended). May not be taken for credit if credit already obtained in BUT 304.

**BUT 330 Biodiversity and Ecosystem Function of Algae**

★3 (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 BUT 205 and BIOL 208 recommended.
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.

**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: BIOCHEM 200 or BIOCHEM 203 or 220. BOT 205 recommended. May not be for credit if credit already obtained in BOT 250.

**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.

**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.

**BOT 385 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 308 or consent of Instructor. BOT 205 recommended.

**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 302 or GENET 364. BOT 303 recommended. Offered in odd-numbered years. Credit cannot be obtained for both INT D 455 and BOT 403.

**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.

**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.

**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.

**BOT 443 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. BIOCHEM 510, 520, 530, 541, 550, 555, 560; CHEM 361, 363, 461; CELL 303, 301; IMMUN 371, 372, 452; INT D 421; MA SC 400, 401, 402, 410, 412, 420, 425, 430, 437, 440, 445, 470, 480; MIMI 405, 415, 520; NEURO 472; NU FS 363; PALEU 318, 319; PHARM 601.

**BUS 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.

**BUS 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.

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### 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. Upon 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**

3 (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 6) (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 period of three weeks, 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 changes, 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, 0-1.5a-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, 0-1.5a-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 pollution, Sulphur Dioxide and climate change. Environmental policies and sectoral 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

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 ENGU 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 ENGU 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. Substantive 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 ENGU 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 in order 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 ENGU 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, BCE, ILS, multinational, 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. Prerequisite: 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
★★★(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

★ CA FR 320 Les francophonies canadiennes et acadiéennes I: perspectives historiques et culturelles
★★★(fi 6) (l’un ou l’autre semestre, 3-0-0). Les fondements et l’évolution des communautés francophones et acadiennes du Canada, de l’Acadie, 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.

★ CA FR 322 Les francophonies canadiennes et acadiéennes II: perspectives idéologiques et politiques
★★★(fi 6) (l’un ou l’autre semestre, 3-0-0). La littérature canadienne-française, des origines à nos jours, vue à travers un choix d’œuvres dominantes marquant les diverses périodes de son évolution. Préalable(a): FRAN 235.

★ CA FR 350 Panorama de la littérature canadienne-francaise
★★★(fi 6) (l’un ou l’autre semestre, 3-0-0). Littérature canadienne-française, de la littérature canadienne 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 E1CAN 322.

★ CA FR 350 Panorama de la littérature canadienne-francaise
★★★(fi 6) (l’un ou l’autre semestre, 3-0-0). Littérature canadienne-française, de la littérature canadienne 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 E1CAN 322.

★ CA FR 408 Choix de sujet
★★★(fi 6) (l’un ou l’autre semestre, 3-0-0). Préalable(a): FRANC 235 et ★3 en littérature de niveau 300, préférentiellement CA FR 350.

★ CA FR 485 Ecriture au féminin dans la littérature québécoise ou canadienne d’expression française
★★★(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(a): 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

★ CELL 201 Introduction to Molecular Cell Biology
★★★(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 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: CHEME 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.

★ CELL 300 Advanced Cell Biology I
★★★(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.

★ CELL 301 Advanced Cell Biology II
★★★(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
★★★(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 readings 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
★★★(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
★★★(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 seminars, guest lectures, 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
★★★(fi 6) (either term, 0-0-0). 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
★★★(fi 6) (either term, 0-0-0). 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
★★★(fi 6) (two term, 0-0-0). 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
★★★(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
★★★(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

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The following courses were renumbered effective 2001/2002

CME 684 Graduate Seminar IV

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The following courses were renumbered effective 2005/06

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.

CME 200 Introduction to Chemical and Materials Engineering

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The following courses were renumbered effective 2001/2002

CME 265 Process Analysis

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Note: Offered in odd-numbered years.

CME 268 Graduate Seminar I

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Note: Offered in odd-numbered years.
CH 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 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: CH E 416, 445 and 464. Registration restricted to students in the Oilsands Engineering Option.

CH 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 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; control process using digital computers. Prerequisites: MATH 201 and 209. Corequisite: CH E 312.

CH 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; feedback control; process control applications. Prerequisites: MAH 201 or equivalent, MAH 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 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 L 312, 314 and 351.

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

CH 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 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 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 L 416. Credit may not be obtained in this course if previous credit has been obtained for CH E 465.

CH 465 Chemical Engineering Project Laboratory
★4 (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 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 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 L 416. Credit may not be obtained in this course if previous credit has been obtained for CH E 502.

CH 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 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 L 243, MAH 252 or equivalent and MAH 201 or consent of instructor.

CH 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 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 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 the practical application of the fundamentals of chemical engineering. Linear 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 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 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 537 Environmental Aspects of Oilsands Processing

CH 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 L 374 and MAH 201 or consent of Instructor.

CH 572 Modelling Process Dynamics

CH 573 Digital Signal Processing for Chemical Engineers
★3.8 (fi 6) (second term, 3-0-2). 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 L 358 and 446.

CH 576 Intermediate Process Control
★3.8 (fi 6) (second term, 3-0-2). 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 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 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: MIRC 265 or consent of Instructor.

CH 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 (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 (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 (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** (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** (either term, 3-0-0). Potential, boundary layer, viscometrics, and secondary flows; application to multiphase phenomena.

CH E 615 Advanced Separation Processes
3** (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** (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** (either 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** (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

CH E 632 Polymer Melt Processing
3** (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** (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** (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** (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** (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** (either term, 3-0-0). 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** (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** (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** (either term, 2-0-0). Numerical solutions of engineering problems using linear and nonlinear sets of equations, ordinary and partial differential equations.

CH E 685 Graduate Seminar III
1** (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** (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** (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** (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** (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** (variable, unassigned).

221.36 Chemistry, CHEM
Department of Chemistry
Faculty of Science

Undergraduate Courses

CHEM 101 Introductory University Chemistry I
3** (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** (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** (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** (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** (either 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, alkyne, 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 nuclear spectroscopy, 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. Included 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 halogen, oxygen, sulfur, and the hydrocarbon group. Introduction to stereochemistry, three dimensional structure, reaction mechanisms, especially addition to double bonds, nucelophilic 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 functional groups of simple and complex compounds including alkenes, 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.

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, single 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, 0-0-0). 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 work 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 HUM position. Credit for this credit 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, hydroxyl 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. Hisk 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, spectrophotometric, and electrochemical analysis. Volumetric techniques are covered briefly. Instrumental techniques discussed include gas and liquid chromatography, UV and IR spectroscopy, atomic absorption 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; ★ 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 nanocrystalline 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. This 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: colloidal properties; electrochemical cells and ion activities, implications for ionic equilibrium; 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 subject matter will include: molecular orbital theory, electronic spectra 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, entropy, entropy and Gibbs free energy, and the microscopic molecular properties, energy levels. Prerequisite: CHEM 262 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, 0-1-8). 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, 0-1-8). 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 electron-transport and solid-state electrochemical systems and a quantum description of magnetic resonance experiments (the Bloch equations); (3) relaxation effects; (4) Fourier transform spectroscopy; (5) spectra; (6) nuclear magnetic resonance spectroscopy; perturbation methods; selection rules in molecular properties. Topics include group theory with emphasis on vibrational spectroscopy; quantum mechanics of vibration and rotation; 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 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. Immunooassay. 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, electrophoretic 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 427 Molecular Symmetry and Spectroscopy
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 431 Structure in the Solid State
3 (fi 6) (third 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 432 Synthesis and Applications of Inorganic and Nano-materials
3 (fi 6) (either term, 3-0-0). Introduction to synthesis 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, reverse microemulsion synthesis, and some reactions. Prerequisite: CHEM 341.

CHEM 436 Transition Metal Chemistry
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) current research of transition metals and oxidation states, (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 437 Solid State Chemistry
3 (fi 6) (either term, 3-0-0). Introduction to the chemistry of extended inorganic solids. Topics 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 438 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 techniques (scanning probe microscopies (SPM), AFM, STM, etc.). The strengths, weaknesses, and complementarities of the techniques used will be examined via case studies on the characterization of real-world nanotechnologies, such as heterogeneous catalysis, 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 451 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 455 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 457 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 461 Organic Analysis
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 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 466 Organic Analysis
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 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 495 Molecular Dynamics and its Applications

3 (fi) (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

3 (fi) (two term, 0-2s-0).

CHEM 504 Advanced Research Seminar

3 (fi) (two term, 0-2s-0).

CHEM 523 Special Topics in Advanced Analytical Chemistry

3 (fi) (either term, 3-0-0).

CHEM 531 Organometallic Chemistry

3 (ti) (second term, 3-0-0). Prerequisite: CHEM 437 or consent of Department.

CHEM 533 Asymmetric Catalysis

3 (ti) (either term, 3-0-0).

CHEM 545 Special Topics in Inorganic Chemistry

3 (ti) (either term, 3-0-0).

CHEM 556 Special Topics in Physical Organic Chemistry

3 (fi) (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) (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 (ti) (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 (ti) (second term, 3-0-0). Prerequisite: consent of Department.

CHEM 599 Fundamentals and Applications of Mass Spectrometry

3 (fi) (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 (ti) (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 (si) (deuxième semestre, 3-1s-3). Étude 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) (l'un ou l'autre semestre, 3-1s-3/2). Stoichiométrie, 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) (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) (premier semestre, 3-0-3). Étude 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 la réactivité des composés de carbone. L'accent sera mis sur les alcanes, les alcanènes, les alcynes, les halogénures d'alkyle, les alcénoïdes, 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) (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, antibiotiques, amino-acides, protéines, acides nucléiques). L'accent sera mis sur les acides, 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) (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. Étude des groupes fonctionnels. L'accent sera mis sur les hydrocarbures et leurs dérivés qui contiennent les hétéroatomes (halogènes, oxygène, soufre, 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) (deuxième semestre, 3-0-3). Continuation de l'étude des propriétés structurales et chimiques des groupes fonctionnels avec accent sur les alcénoïdes, 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. Étude 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.
Course Listings

University of Alberta

(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.

CHINA 101 Basic Chinese I  
- 1 (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.

CHINA 102 Basic Chinese II  
- 1 (third 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.

CHINA 201 Basic Chinese III  
- 1 (either term, 0-5L-0). A continuation of CHINA 102. Designed to develop further basic skills in spoken and written Chinese. Prerequisite: CHINA 102.

CHINA 202 Basic Chinese IV  
- 1 (either term, 0-5L-0). A continuation of CHINA 201. Designed to develop further basic skills in spoken and written Chinese. Prerequisite: CHINA 201.

CHINA 211 Mandarin Chinese I  
- 1 (first term, 3-0-0). 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 Chinese.

CHINA 212 Mandarin Chinese II  
- 1 (second term, 3-0-1). Continuation of CHINA 211. Prerequisite: CHINA 211.

CHINA 220 Body, Mind and World in Chinese Culture  
- 1 (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  
- 1 (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  
- 1 (third 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 302 or consent of Department. Not open to students with credit in CHINA 450.

CHINA 300 Intermediate Chinese I  
- 1 (first term, 0-4L-0). Continuing study of spoken and written modern standard Chinese. Conversation and composition are integrated with reading and discussion of texts of modern Chinese prose, fiction, and other kinds of writing. Prerequisite: CHINA 200, 202, or 280.

CHINA 302 Intermediate Chinese II  
- 1 (second term, 0-4L-0). A continuation of CHINA 301. Prerequisite: CHINA 301.

CHINA 309 Drama and Film in Chinese  
- 1 (third 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.

CHINA 318 Business Chinese I  
- 1 (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.

CHINA 319 Business Chinese II  
- 1 (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 Literature in English Translation  
- 1 (either term, 3-0-0). Chinese literature from earliest times through the Qing Dynasty. Readings and lectures in English. Note: Does not fulfill 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  
- 1 (third 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.

CHINA 337 Women in Modern Chinese Literature and Film  
- 1 (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.

CHINA 338 Identity and Social Change in Contemporary China  
- 1 (either term, 3-0-0). Colonialism, post-colonialism, modernity/ 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 degree.

CHINA 341 Classical Chinese I  
- 1 (third term, 3-0-0). An introduction to the syntax and semantic structures of classical Chinese. Prerequisite: CHINA 200 or 202.

CHINA 342 Classical Chinese II  
- 1 (third term, 3-0-0). A continuation of CHINA 341. Prerequisite: CHINA 341.

CHINA 370 The Chinese Language in its Cultural Setting II  
- 1 (third 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.

CHINA 401 Advanced Chinese I: Chinese in Mass Media  
- 1 (either term, 3-0-0). Chinese language through contemporary film, television programs and newspapers. Prerequisite: CHINA 302 or consent of Department.

CHINA 402 Advanced Chinese II: Literature and Society  
- 1 (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.

CHINA 410 Classical Chinese Poetry  
- 1 (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.

CHINA 414 Chivalric Tales and Love Stories  
- 1 (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.

CHINA 420 Chinese Modernity: Literature and Film  
- 1 (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.

CHINA 425 Post-Mao Fiction  
- 1 (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  
- 1 (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  
- 1 (either term, 3-0-0). The practice of translation in media, government, and business. Prerequisite: CHINA 302 or consent of Department.

CHINA 455 Topics in Taiwan Literature  
- 1 (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  
- 1 (either term, 3-0-0). Prerequisite: Any of senior courses in Chinese or consent of Department.

CHINA 483 Supervised Readings in Chinese  
- 1 (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 (either term, 3-0-0).

**Graduate Courses**

**CHINA 500 Topics in Chinese Language**
3 (either term, 3-0-0). A reading knowledge of Chinese is required.

**CHINA 501 Methods of Research: Pre-Modern**
3 (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 (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 (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 (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 (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 (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**

**CHRTC 100 The Bible and the Origins of the Christian Church**
3 (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.

**CHRTC 172 Introduction to Catholic Moral Thought**
3 (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.

**CHRTC 250 The Theological Education of the Catholic Teacher**
3 (either term, 3-0-0). The components that make up the education of the Catholic teacher. Issues include creedal statements, the moral and social teachings of the Church, liturgical practices, a general theology and theory of Catholic education.

**CHRTC 264 Dimensions of the Christian Faith**
3 (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 CHHICL 384.

**CHRTC 266 Jesus in the New Testament**
3 (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 (either term, 3-0-0). A theological and scriptural exploration of four central themes of these New Testament writings and their contemporary relevance.

**CHRTC 270 The Catholic Church Today**
3 (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.

**CHRTC 292 Spirituality for Today’s Christian**
3 (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.

**CHRTC 314 Modern and Contemporary Film and Christian Values**
3 (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.

**CHRTC 349 Christianity and Social Justice in Canada**
3 (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.

**CHRTC 350 Science and Religion: Christian Perspectives**
3 (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.

**CHRTC 351 Human Sexuality and Marriage: Christian Perspectives**
3 (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.

**CHRTC 352 Bioethical Issues: Christian Perspectives**
3 (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 discussions.

**CHRTC 353 Christian Perspectives on Imagination and Literature**
3 (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.

**CHRTC 354 The Gospels of Matthew, Mark, and Luke**
3 (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.

**CHRTC 355 The Catechism of the Catholic Church: Theological Perspectives**
3 (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.

**CHRTC 356 Theologies of Christian Religious Education**
3 (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.

**CHRTC 371 The Sacraments**
3 (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.

**CHRTC 380 Christian Religious Education and the Child**
3 (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.

**CHRTC 381 Christian Religious Education and the Adolescent/Young Adult**
3 (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.

**CHRTC 390 Neuroscience, the Person and Christian Theology**
3 (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.

**CHRTC 391 Women’s Spirituality in Contemporary Christianity**
3 (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.

**CHRTC 394 Business Ethics: Christian Perspectives**
3 (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.
CHRTP 305 Christian Scriptures

CHRTP 312 The Question of Faith

CHRTP 313 Topics in Applied Christian Ethics

CHRTP 314 Topics in Women and Religion

CHRTP 315 Topics in Religion and Literature

CHRTP 316 Issues in Contemporary Sexuality and Spirituality

CHRTP 317 New Issues in Theology

CHRTP 386 Environmental Issues: Christian Perspectives

CHRTP 407 Topics in Christian Religious Education

CHRTP 423 Advanced Bioethics

CHRTP 449 Field Placement in Christian Service

CHRTP 450 Directed Readings in Catholic Theology

CHRTP 451 Modern Creationisms

CHRTP 452 The Makers of Modern Theology

Undergraduate Courses

CHRTP 301 Hebrew Scriptures

CHRTP 305 Christian Scriptures

CHRTP 312 The Question of Faith

CHRTP 313 Topics in Applied Christian Ethics

CHRTP 314 Topics in Women and Religion

CHRTP 315 Topics in Religion and Literature

CHRTP 316 Issues in Contemporary Sexuality and Spirituality

CHRTP 317 New Issues in Theology

CHRTP 318 Feminist Theology

CHRTP 418 The Makers of Modern Theology

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
The document contains a list of course descriptions. Here's a structured representation of the text:

- **CIV E 321 Principles of Environmental Modeling and Risk**
  - (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**
  - (either term, 3-1-0). 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: MAI1 201 and 209.

- **CIV E 331 Applied Hydraulics**
  - (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**
  - (either term, 3-2s-0). Introduction to structural loads; deformations of statically determinate systems and structures; fundamentals of statics and stress analysis; direct stiffness analysis. Prerequisite: CIV E 270.

- **CIV E 374 Structural Design I**
  - (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**
  - (either term, 3-0-3). Introduction to soil mechanics; soil behavior and engineering properties; soil classification; soil behavior and constitutive models; soil analysis and design. Prerequisites: MAI1 252 or ENV E 220.

- **CIV E 395 Civil Engineering Analysis III**
  - (either term, 3-0-3). Introduction to numerical analysis of structures. Application of the methods of structural analysis to the solution of problems in civil engineering. Prerequisite: CIV E 251 or CIV E 252.

- **CIV E 399 Introduction to Continuum Mechanics**
  - (either term, 3-1-0-1). 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. Prerequisite: CIV E 270 and MAI1 209.

- **CIV E 404 Construction Methods**
  - (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**
  - (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**
  - (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. Prerequisite: CIV E 303 and 372.

- **CIV E 421 Processes for Public Health and Environmental Protection**
  - (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**
  - (second term, 3-0-3). Fundamentals of municipal design, planning and environmental impact assessment; detailed design and assessment projects; reports; presentations; 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**
  - (either term, 3-0-3/2). Hydrotechnological 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**
  - (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**
  - (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**
  - (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**
  - (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**
  - (either term, 3-0-3). Site investigation; stress 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**
  - (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**
  - (either term, 1-3-0-0). 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**
  - (third term, 3-0-3). Graduate Courses

- **CIV E 506 Construction Estimating, Planning, and Control**
  - (either term, 3-0-3). 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**
  - (second term, 3-0-0). Fundamentals of municipal design, planning and environmental impact assessment; detailed design and assessment projects; reports; presentations; field trips. Prerequisites: CIV E 321, 321, and 421.

- **CIV E 540 Hydraulic Engineering**
  - (third 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**
  - (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. Prerequisites: CIV E 374 and 474.

- **CIV E 591 Geotechnical Design**
  - (either 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. Prerequisite: CIV E 481.

- **Graduate Courses**

- **CIV E 601 Project Management**
  - (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**
  - (third 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

Chair (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, 3-0-1). Application of technical tools for modeling 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 layout.

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

★3.5 (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 used in wastewater treatment. Methods of water quality management; oxygen; chemical and microbial models, natural and induced re-eration techniques; thermal pollution and ice cover considerations.

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, influent 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-eration 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, odor 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


CIV E 631 Engineering Fluid Mechanics

★3.5 (fi 6) (either term, 3-0-1). Navier-Stokes equations and viscous flow. Development of decision support systems for 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 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


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 similarity; 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 fluid mechanics. Engineering, including: transient pipe and open channel flows, 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). How and sediment transport in alluvial channels; engineering geomorphology; river ecology; design of river engineering installations.

CIV E 641 Advanced Surface Water Hydrology


CIV E 644 Stochastic Processes of Hydrology

★3.5 (fi 6) (either term, 3-0-0). Probability distributions of random phenomena, parameter estimates and applications in hydrology. Analysis and modelling of hydrologic time series using Autoregressive Moving-Average (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, 3-0-0). 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 (f 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 (f 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 (f 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 (f 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 facilities. Environmental management plans and audits, communication with stakeholders, and review of projects. Prerequisite: CIV E 620 and 622. |

CIV E 658 Design of Civil Engineering Experiments
| 3 (f 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 (f 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

CIV E 664 Introduction to Solid Mechanics
| 3 (f 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 (f 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 (f 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 (f 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 (f 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 (f 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 (f 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 (f 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 (f 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

CIV E 681 Seepage and Drainage
| 4 (f 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 (f 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 (f 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 (f 6) | (second term, 3-1s-1). Information sources in engineering geology and terrain analysis, elements of the geology of sediments and glacial geology. Upland 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 (f 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 (f 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

CIV E 692 Tunneling
| 3.5 (f 6) | (second term, 3-1s-1). Methods of tunneling, 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 (f 6) | (either term, 3-0-0). Implications for northern development, extent, engineering classification, settlement, 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

CIV E 697 Rock Engineering
| 4 (f 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.

CIV E 698 Petroleum Geomechanics

3 (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 (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 (either term, 3-0-0).

CIV E 719 Advanced Topics in Transportation and Highway Engineering

3 (either term, 3-0-0).

CIV E 729 Advanced Topics in Environmental Engineering

3 (either term, 3-0-0).

CIV E 739 Advanced Topics in Fluid Mechanics and Hydraulics

3 (either term, 3-0-0).

CIV E 749 Advanced Topics in Water Resources Engineering

3.5 (either term, 3-0-1). Related Lab experiments.

CIV E 779 Advanced Topics in Structural Engineering

3 (either term, 3-0-0).

CIV E 799 Advanced Topics in Soil Mechanics

3 (either term, 3-0-0).

CIV E 900 Directed Research Project

3 (either term, 3-0-0).

221.42 Classics, CLASS

Department of History and Classics

Faculty of Arts

Notes

(1) None of the courses under this heading will fulfill 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 480 through the 500-level are designed for fourth-year

Honors, and graduate students. Because specific 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

CLASS 102 Greek and Roman Mythology

3 (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 (either term, 3-0-0). Formerly CLASS 270.

CLASS 104 Introduction to Ancient Rome

3 (either term, 3-0-0). Formerly CLASS 271.

CLASS 110 The Ancient World

3 (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.

CLASS 221 Literature of Greece and Rome

3 (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 (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 (either term, 3-0-0). Survey of the art, artifacts, and monuments of the Ancient Roman World. Formerly CLASS 252.

CLASS 261 Women in the Ancient World

3 (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 (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 (either term, 3-0-0). Not open to students with credit in any two of

CLASS 365, 366, 376 and 379.

CLASS 294 Ancient Science, Technology, and Medicine

3 (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.

CLASS 302 Classical Myth and Religion

3 (either term, 3-0-0). The background and origin of classical mythology and religion; Mycenaean 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 (either term, 3-0-0). Examination of the nature of pre-Christian religious practices in antiquity.

CLASS 321 Greek Literature in Translation

3 (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.

CLASS 322 Latin Literature in Translation

3 (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 (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 (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 (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 (either term, 3-0-0). Prerequisites: CLASS 254 or 255.

CLASS 360 Ancient Historiography

3 (either term, 3-0-0). Examination of the development of history writing in Classical Antiquity. Prerequisite: CLASS 280 or 281.

CLASS 375 History of Medicine in the Ancient World

3 (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.

CLASS 376 Early Civilization I

3 (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.

CLASS 380 History of Palestine

3 (either term, 3-0-3). From the Persian Conquest to the time of Jesus.

CLASS 387 Pre-Islamic North Africa

3 (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) (either term, 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.

CLASS 399 Topics in the Ancient World ★3 (fi 6) (either term, 3-0-0). Prerequisite: CLASS 281 or consent of Department.

CLASS 463 Topics in Roman Republican History ★3 (fi 6) (either term, 0-3s-0). Prerequisite: CLASS 281 or consent of Department.

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.

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.

CLASS 475 Techniques of Classical Field Archaeology ★3-6 (variable) (either term, 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.

CLASS 476 Advanced Field Techniques in Classical Archaeology ★3-6 (variable) (either term, 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.

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.

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.

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.

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.

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 Samnite 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

C 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.

C 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.

C 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.

C 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.

C 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.

C 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.

C 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.

C 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.

C 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).

C 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.

C C LIT 297 Special Topics in Comparative Literature ★3 (fi 6) (either term, 0-3s-0).

C 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.
C LIT 342 Science Fiction

An introduction to science fiction as an international genre and a survey of works and trends.

C LIT 343 Fairy Tales and Folk Tales

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.

C LIT 344 Elements of Narrative Fiction

An international survey of the main features of a narrative text, with historical examples and an emphasis on theory.

C LIT 345 Elements of Poetry

An international survey of the main features of a poetic text, with historical examples and an emphasis on theory.

C LIT 346 Elements of Drama

An international survey of the basic components and forms of dramatic structure, with historical examples and an emphasis on theory.

C LIT 352 Relations among Literature, the Arts, Film and the Media

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.

C LIT 358 Great Themes of Literature and Art

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.

C LIT 360 Marginalized Literatures

An introduction to literatures of minorities and lesser known national literatures.

C LIT 362 International Movements in Contemporary Literature

This course is designed to introduce the student to such topics as literature of the absurd, existential literature, and surrealism.

C LIT 363 Latin America in Its Literature (in English Translation)

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 51 369 or SPAN 360.

C LIT 372 Comparative Studies in Canadian Prose

Study of narrative and other forms of Canadian prose, chiefly French and English, examined on a comparative basis within an international framework.

C LIT 373 Comparative Studies in Popular Culture

An international and typological analysis of selected topics in popular culture and media, their changing status in society and culture, as well as their interaction with canonized forms of literature and the arts.

C LIT 374 Autobiographical Writing

A survey of autobiographical forms from antiquity to postmodernity and a study of theoretical problems of genre and subjectivity.

C LIT 375 Hermeneutics

History and development of hermeneutics with emphasis on its relevance to the study of literary and religious texts. Note: This course is equivalent to HELIIG 445.

C LIT 378 Studies of Forms and Genres

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.

C LIT 379 Special Topics in Comparative Literature

An advanced study of a particular critical theory. Topics may include feminism, Marxism, Post-Colonialism, and other current orientations.

C LIT 380 Fundamentals of Comparative Literature

Disciplinary issues, approaches and methodologies in Comparative Literature as they differ from those of national literatures.

C LIT 381 Studies in Literary Genres

An advanced study of ‘genre’ (e.g., the novel) in an international and a particular historical context.

C LIT 382 Literature and Society

International comparative studies of the interrelationship of literature and society.

C LIT 383 Literature and Science

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.

C LIT 472 Advanced Comparative Studies in Canadian Prose

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.

C LIT 474 Studies in the Relationship of Literature and the Visual Arts

A cross-cultural study of the interrelations between art and literature.

C LIT 480 Directed Reading in Comparative Literature

Variable content. Prerequisite: consent of Department.

C LIT 497 Special Topics in Comparative Literature

Variable content. Prerequisite: consent of Department.

C LIT 498 Honors Tutorial and Essay

Preparation of the Honors Essay.

Graduate Courses

C LIT 501 Studies in World Literature I

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 502 Studies in World Literature II

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 507 Topics in Major Contemporary Currents in Literary and Cultural Theory I

Variable content. Prerequisite: Reading knowledge of one relevant language other than English. Note: equivalent to MLCS 507.

C LIT 508 Topics in Major Contemporary Currents in Literary and Cultural Theory II

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 511 Directed Reading Course I

Prerequisite: consent of Department.

C LIT 522 Directed Reading Course II

Prerequisite: consent of Department.

C LIT 554 Comparative Studies in the Novel

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 585 Studies of Forms and Genres

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 610 Special Topics in Literary Theory and Criticism

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 630 Cross-Cultural Studies in Literature

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.

C LIT 645 Comparative Studies in 20th-Century Literature

Prerequisite: Reading knowledge of one relevant language other than English.

C LIT 696 Seminar Course

Prerequisite: Reading knowledge of two languages other than English.

C LIT 697 Special Reading Course I

Prerequisite: consent of Department.

C LIT 698 Special Reading Course II

Prerequisite: consent of Department.

C LIT 900 Directed Research Project

Unassigned.

Computer Engineering, CMPE

Division of Computer Engineering, Departments of Computing Science, Electrical and Computer Engineering, and faculties of Engineering and Science

Undergraduate Courses

CMPE 210 Principles of Software Implementation

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: ENCMPC 100. Corequisite: CMPC 115.


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: CMPC 310.

CMPE 400 Computer Organization and Architecture ★3 (fi 6) (either term, 3-0-3). Survey of modern computer architecture and design concepts. Benchmarks, instruction set design and encoding. Pipeline 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 CMPC 229. Credit may be obtained in only one of CMPC 382 or CMPC 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 CMPC 229.


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: CMPC 320, CMPC 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: CMPC 300. Note: Only one of the following courses may be taken for credit: CMPE 420 or CMPE 510.

CMPE 440 Software Systems Design Project ★3 (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. Management of software development projects. Provides a capstone experience in software development processes. Prerequisite: CMPC 410.


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 FPGA’s are used to design and implement logic circuits. Prerequisite: E E 351. Note: Only one of the following courses may be taken for credit: CMPC 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: CMPC 487 or CMPC 313.

CMPE 490 Design of Microprocessor-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 covers a major laboratory component and requires the design and fabrication of a complete microprocessor-based system. Prerequisites: E E 380 or CMPC 229, CMPC 480 or E E 480. Only one of the following courses may be taken for credit: CMPC 490 or CMPC 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, CMPC

Department of Computing Science
Faculty of Science

Undergraduate Courses

CMPC 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.

CMPC 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.

CMPC 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: CMPC 102 or CMPC 114 or ENCMPC 100. See Notes (2) and (3) above.

CMPC 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
\[ \text{either term, 3-0-3} \] General introduction to number representation, architecture and organization concepts of von Neumann machines, assembly level programming, exceptions, handling, permissions, pointers, debugging tools. Basic conceptual computing and memory management. Prerequisite: CMPUT 115. Corequisite: CMPUT 201. Credit may be obtained in only one of CMPUT 229, 285 or E E 380.

CMPUT 272 Formal Systems and Logic in Computing Science
\[ \text{either term, 3-1s-1.5} \] 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
\[ \text{either term, 3-0-3} \] 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 298 Topics in Computing Science
\[ \text{either term, 3-0-3} \] A 100-level CMPUT course.

CMPUT 300 Computers and Society
\[ \text{either term, 3-1a-0} \] 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
\[ \text{either term, 3-0-3} \] Object-oriented design and analysis, with interactive applications as the primary example. Topics include: software process; revision control; United 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
\[ \text{either term, 3-0-3} \] 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, SI A1 221 or 265; one of MATH 225, 228, 229 or consent of Instructor.

CMPUT 306 Introduction to Image Processing
\[ \text{either term, 3-0-3} \] 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 E E 380 or EE 450.

CMPUT 313 Computer Networks
\[ \text{either term, 3-0-3} \] 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. Houting 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] Digital circuits, combinational systems, memory, register transfer, control logic design, CPU design, and advanced topics on microarchitectures. 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] 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 281.

CMPUT 399 Topics in Computing Science
\[ \text{either term, 3-0-3} \] A 200-level CMPUT course.

CMPUT 400 Industrial Internship Practicum
\[ \text{either term, 3-0-3} \] (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: W Kl X P 922.

CMPUT 401 Software Process and Product Management
\[ \text{either term, 3-1s-3} \] 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] 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
\[ \text{either term, 3-0-3} \] 2-D and 3-D transformation; 3-D modeling and viewing; illumination models and file interpretations; 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
\[ \text{either term, 3-0-3} \] 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 EE 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 E E 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 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 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, foraging control, data-mining, and learning from examples. This course will present a variety of learning algorithms (e.g., 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 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, 3-0-3). Formal languages; normal forms; relation 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, 226 or 227 or consent of Instructor.

**CMPUT 495 Honors Seminar**

*3 (fi 6) (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 Topics 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).
Les caractéristiques de l’approche

**Course Listings**

- CMPUT 633 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 640 Topics in Computer Networks
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 641 Advanced Computer Networks
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 642 Computer Network Protocols
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 643 Special Purpose Networking
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 644 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 650 Topics in Artificial Intelligence
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 651 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 652 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 654 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 655 Constraint-Based Reasoning
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 656 Logic Foundations
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 657 Heuristic Search
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 658 AI and Cognitive Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 659 Adaptive Systems
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 660 Topics in Software Engineering
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 661 Software Architecture
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 662 Software Specification and Verification
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 663 Software Process and Quality
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 664 Software Evolution
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 666 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 670 Topics in the Theory of Computation
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 671 Empirical Algorithmics
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 672 Algorithmic Graph Theory
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 673 Complexity Theory
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 674 Combinatorial Computing
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 675 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 680 Topics in Systems
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 681 Parallel Programming
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 682 Fundamentals of Distributed Systems
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 683 Performance Evaluation
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 684 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 689 Topics in Databases
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 691 Object-Oriented Databases
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 692 Modern Database Management Systems
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 693 Distributed Database Systems
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 694 Information Retrieval
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 695 Knowledge Discovery in Data
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 696 Data Management in the Internet
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 697 Topics in Computing Science
  - 01 (0 6) (either term, 3-0-0).
- CMPUT 701 Essay in Computing Science I
  - 01 (0 12) (either term, 0-1s-5). A major essay on an agreed topic.
- CMPUT 702 Essay in Computing Science II
  - 01 (0 6) (either term, 3-0-0).

**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)

CU ME 309 Didactique de la communication orale et écrite à l’élémentaire

CU ME 321 Didactique des mathématiques au niveau élémentaire
- 01 (0 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
- 01 (0 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’Éducation, 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
- 01 (0 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
- 01 (0 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
- 01 (0 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
- 01 (0 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 345.

CU ME 347 Les technologies de l’information et de la communication (TIC) en éducation
- 01 (0 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 propres à son intégration dans les matières de base.
CU ME 358 Enseignement du français au niveau secondaire


CU ME 359 Enseignement de la littérature au niveau secondaire


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’Éducation; 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): ☆☆ 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 présentes par le ministère de l’Éducation; 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): ☆☆ 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): ☆☆ 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


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.

CU ME 498 L’enseignement religieux et l’éducation morale

(3 (fi 6) (l’un ou l’autre semestre, 3–0–0). Familiarisation dans le domaine de l’enseignement au niveau secondaire.

CU ME 499 Étude 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.

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, rhythmic 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.

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.

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.

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: PLDS 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 social dance principles.

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

DANSK 111 Beginners’ Danish I
⁴ (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.

DANSK 112 Beginners’ Danish II
⁴ (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.

DANSK 211 Second-Year Danish I
⁴ (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.

DANSK 212 Second-Year Danish II
⁴ (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
⁴ (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
⁴ (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
⁴.5 (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
⁴ (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
⁴ (fi 6) (either term, 102 hours). A clinical course integrating the knowledge, practice, and skills of dental hygiene practice.

D HYG 215 Biomaterials
⁴ (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
⁴ (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
⁴ (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
⁴.5 (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
⁴ (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
⁴.5 (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
⁴ (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
⁴ (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
⁴ (fi 3) (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
⁴ (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
⁴ (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
⁴ (fi 5) (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
⁴.5 (fi 3) (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
⁴ (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
⁴ (fi 2) (either 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
⁴ (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**
- **1.25** (either term, 60 hours). A didactic and lab course covering anatomy, physiology, and pharmacology of different anesthetics. 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**
- **1.7** (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**
- **1.2** (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**
- **1.2** (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**
- **1.2** (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.

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### 221.52 Dentistry, DENT

**Graduate Courses**

**DENT 532 Growth and Development**
- **1.2** (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**
- **1.4** (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**
- **1.2** (two term, 525 hours). Applied clinical education and experience is obtained through supervised management of selected orthodontic cases.

**DENT 542 Research Methodology**
- **1.1** (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**
- **1.3** (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**
- **1.3** (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**
- **1.2** (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**
- **1.2** (first term, 28 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**
- **1.2** (second term, 28 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.

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### Undergraduate Courses

**DDS 506 Gastroenterology and Nutrition**
- **1.5** (either term, 6 weeks). An integrated course covering nutrition, gastrointestinal physiology, pathophysiology and anatomy. Related surgical, pediatric and geriatric topics will also be addressed. Open only to students registered in the DDS program.

**DDS 507 Neurosciences**
- **1.9** (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.

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**DENT 741 Orthodontic Clinics**
- **1.8** (even term, 280 hours). Second year seminar and preclinical presentations. Requires successful completion of DENT 540.

**DENT 641 Orthodontic Clinics**
- **1.8** (odd term, 280 hours). Second year applied clinical educational program. Requires successful completion of DENT 541.

**DENT 642 Orthodontic Clinics**
- **1.8** (even term, 280 hours). Third year applied clinical educational program. Requires successful completion of DENT 641.

**DENT 800 Special Registration**
- **1.0** (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.

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**Dentistry, DDS**

**Department of Dentistry**

**Faculty of Medicine and Dentistry**

**Undergraduate Courses**

**DDS 506 Gastroenterology and Nutrition**
- **1.5** (either term, 6 weeks). An integrated course covering nutrition, gastrointestinal physiology, pathophysiology and anatomy. Related surgical, pediatric and geriatric topics will also be addressed. Open only to students registered in the DDS program.

**DDS 507 Neurosciences**
- **1.9** (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**
- **1.2** (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**
- **1.2** (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**
- **1.6** (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)**
- **1.2** (either term, 60 hours). Coronal, radicular and pulp morphology of the primary and permanent dentitions.

**DDS 518 Oral Biology I**
- **1.8** (either term, 60 hours). Development, histology, and comparative anatomy of the craniofacial complex and dental tissues.

**DDS 520 Patient-Centred Care**
- **1.6** (two term, 2-6s-0). A continuation of DDS 510, which involves further
discrimination 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 musculoskeletal system. Open only to students registered in the DDS program.

DDS 525 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, anesthesia, periodontics, endodontics, fixed and removable prosthetics 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 15) (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, represented by the drugs being selected whenever possible for their physiological and clinical significance to the practice of dentistry. Particular emphasis will be placed on anaesthetics, antacids, 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 prosthetic 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  
★5 (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 AKI or UDS courses. Not open to students with credit in ART 131 or AKI 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 UArts 370 or DES 380. Prerequisites: ART 134 and DES 135 or ART 136 and DES 136, and consent of Department. Note: Restricted to students in the Faculty of Education only. Formerly UArts 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: AKI 134 and DES 135 or AKI 136 and UDS 136, and consent of Department. Formerly UArts 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:
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 484 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 graphic designer as a tool for language and visual communication. Black and white photography. Project management and research. Prerequisites: DES 390 and consent of Department. Formerly ULS 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: ULS 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. Prerequisites: ART 322 and UHS 390. Note: Registration priority will be given to BDesign Printmaking Route students. Not open to students who have successfully completed ART 425.

DES 527 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 534 Furniture Design Applications and Production Technologies

★3 (fi 6) (either term, 0-6L-0). 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 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 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.

DELS 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.

DELS 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.

DELS 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.

DELS 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 DELS 592.

DELS 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: DELS 590 and consent of Department.

DELS 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: DELS 592 and consent of Department. Corequisite: DELS 590.

DELS 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: DELS 590 and consent of Department.

DELS 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: DELS 590 and consent of Department.

Graduate Courses

DELS 672 Industrial Design: Concepts, Analysis and Criticism
★10 (fi 20) (either term, 0-18L-0).

DELS 673 Industrial Design: Conceptual Analysis and Practical Applications
★10 (fi 20) (either term, 0-18L-0).

DELS 675 Industrial Design: Directed Readings
★3 (fi 6) (either term, 0-3s-0).

DELS 692 Visual Communication Design: Concepts, Analysis and Criticism
★10 (fi 20) (either term, 0-18L-0).

DELS 693 Visual Communication Design: Conceptual Analysis and Practical Applications
★10 (fi 20) (either term, 0-18L-0).

DELS 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

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 S22.2.3 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 Playscripts
★3 (fi 6) (either term, 3-0-0). Analysis of playscripts 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 UHAMA 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 Urama 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 UHAMA 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-scene, 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) Urama students, and BEd (Secondary) Urama 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 Urama Majors, BA (Honors) Urama students, and BEd (Secondary) Urama Majors. Not to be taken by students with credit in UHAMA 247.

L DRAMA 247 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) Urama, 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). Studio 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 UHAMA 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 and Minors. 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: DHUMA 308 or consent of Department. Note: Required for BA (Honors) Drama students. Note: Not to be taken by students with credit in DHUMA 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.

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.

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 UHMU 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: UHMU 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 BA 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, 0-0-1). 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 241, 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.

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 380 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.

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, 0-8-0). 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 Urama (Technical Theatre) students.

DRAMA 395 Stage Management
★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 398 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 UHMU 503 and 509.

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 masonic 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: UHMU 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, 0-6L-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: UHAMA 456. Note: Restricted to BFA (Acting) students.

**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: UHAMA 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 preparation for and/or the running of a production for performance. Prerequisite: UHAMA 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, 0-0-0). 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-tail 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-tail course.

**DRAMA 554 Rehearsal and Performance**

**6** (fi 12) (two term, 0-2SL-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, 0-10L-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 598 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: UHAMA 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.