

Attendance at a weekly integrative seminar is required. Open to Human Ecology students who have completed 90 units of course weight. Prerequisite: HECOL 480.

## 211.123.2 Graduate Courses

### **S** HECOL 500 Perspectives in Home Economics/Human Ecology

★3 (fi 6) (either term, 3-0-0). Historical and philosophical perspectives about the nature and purpose of human ecology as it has evolved from home economics; exploration of professional issues and alternative modes of professional practice. Restricted to Graduate students only.

### HECOL 501 Independent Project in Human Ecology

★3 (fi 6) (either term, 0-0-6). Independent study of a topic in human ecology planned by the student in consultation with the Instructor. Restricted to graduate students.

### HECOL 550 Selected Topics in Human Ecology

★3 (fi 6) (either term, variable). Topics of current interest. May be taken for credit more than once. Prerequisite: varies with specific offering.

### HECOL 600 Human Ecology Graduate Seminar

★1 (fi 2) (either term, 0-1s-0). Graduate students may register up to three times for a maximum of three credits.

### HECOL 601 Ways of Knowing in Human Ecology

★1 (fi 2) (first term, 0-1s-0). Enquiry into the nature, scope and object of human ecology knowledge; the distinct contributions of various modes of inquiry.

### HECOL 602 Research Strategies and Procedures in Human Ecology

★3 (fi 6) (either term, 0-3s-0). Consideration of various designs and strategies for human ecology research and related procedures for data collection and analysis. Prerequisite: HECOL 601; and FAM 601 or TCC 601. Corequisite: FAM 602 or TCC 602.

### HECOL 616 Families and Work

★3 (fi 6) (either term, 0-3s-0). Analysis of current work and family issues and policies.

### HECOL 650 Seminar in Human Ecology: Selected Topics

★3 (fi 6) (either term, 0-3s-0). May be taken for credit more than once.

### HECOL 651 Advanced Independent Inquiry in Human Ecology I

★3 (fi 6) (either term, 0-0-6). Prerequisite: consent of instructor.

### HECOL 652 Advanced Independent Inquiry in Human Ecology II

★3 (fi 6) (either term, 0-0-6). Prerequisite: consent of instructor.

### HECOL 690 Advanced Seminar in Research Issues in Human Ecology

★1 (fi 2) (either term, 0-1s-0). An in-depth exploration of student and faculty research and the issues which comprise such research. Theoretical, methodological, and intervention issues from a variety of research paradigms shall be explored. Students will be required to attend this seminar each term in residence in the doctoral program.

### HECOL 692 Advanced Seminar in Practice Issues in Human Ecology

★3 (fi 6) (either term, 0-3s-0). This course will address a variety of practice issues (e.g. evaluation, policy development, government and business practice, professional ethics) in family ecology and/or textiles and clothing.

## 211.124 Human Resource Management

Department of Organizational Analysis  
Faculty of Business

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

Students who have completed IND R courses are not allowed to register in a HRM course with the same number.

### 211.124.1 Undergraduate Courses

#### HRM 432 Labor Relations Law and Legislation

★3 (fi 6) (first term, 3-0-0). An examination of the legal framework within which collective bargaining takes place in Canada. Prerequisite: Open only to third- and fourth-year students.

#### HRM 488 Selected Topics in Human Resource Management

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

#### HRM 495 Individual Research Projects

★3 (fi 6) (either term, 3-0-0). Special study for advanced undergraduates. Prerequisites: consent of instructor and Associate Dean. (When a student registers in this course for a second or third time, subsequent higher course numbers are to be used: HRM 496, 497.)

## 211.124.2 Graduate Courses

### HRM 703 Seminar in Human Resource Management

★3 (fi 6) (either term, 3-0-0). A readings seminar covering the theory and relevant research in the areas of human resource management. Reading topics will cover theories pertinent to managing human resources, as well as research articles on human resource planning, recruitment and selection, organizational entry, performance management, compensation, and training and development.

## 211.125 Humanités

Faculté Saint-Jean

### HUME 301 L'humanité et ses besoins matériels: l'individu et la collectivité

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude interdisciplinaire des sociétés occidentales et, plus précisément, de l'importance accordée dans ces sociétés aux biens matériels comme sources de bonheur, de prestige et de pouvoir. L'étude de certains concepts (évolution de l'homme et développement des sociétés, travail/loisir, production/consommation, accumulation/partage, etc.), permettra de cerner les difficultés rencontrées dans des sociétés de plus en plus matérialistes, à satisfaire les besoins et désirs des individus et des collectivités. Note: ce cours faisait partie de HUME 302.

### HUME 303 L'humanité et ses besoins matériels: problèmes et conflits

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude interdisciplinaire des problèmes auxquels doit faire face l'humanité par rapport au progrès matériel et technologique, à l'exploitation et l'utilisation des ressources naturelles, à l'inégalité dans et entre les sociétés, à la dégradation de la planète, aux conflits d'intérêts, aux idéologies nationales et internationales. On posera la question du rôle de l'individu et de la collectivité devant ces problèmes. Prérequis: HUME 301 ou l'accord du Doyen. Note: ce cours faisait partie de HUME 302.

### HUME 401 Optiques et méthodes dans les Humanités

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des différentes façons d'aborder les Humanités: analyse critique, phénoménologie, herméneutique et autres. Travaux pratiques.

### HUME 402 L'humanité et ses besoins culturels/spirituels

★6 (fi 12) (sur deux semestres, 3-0-0). Etude interdisciplinaire du développement de l'humanité, en particulier de la société occidentale, qui relève le défi de répondre à ses besoins culturels/spirituels. Par l'étude de thèmes concrets actuels dans divers domaines, comme la religion, l'art, le langage, la communication, la morale..., l'étudiant sera amené à redécouvrir l'humain à partir du cheminement accompli dans le domaine culturel/spirituel.

### HUME 420 Les grands écrits

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude interdisciplinaire et approfondie de textes importants relatifs à la pensée humaniste et qui proviennent de plusieurs milieux à différents stades du développement de l'humanité, comme le *Yi-king-Le Livre des mutations*, *Bhagavad-Gitâ*, la *Bible*, l'*Odyssee* (Homère), *La République* (Platon), *Géorgiques* (Virgile), *La Divine Comédie* (Dante), *Micromégas* (Voltaire), *The Wealth of Nations* (Smith), *The Origin of Species* (Darwin), *L'Homme et ses symboles* (Jung).

## 211.126 Industrial Relations

Department of Organizational Analysis  
Faculty of Business

### 211.126.1 Undergraduate Courses

**Note:** Refer to Organizational Analysis section.

### 211.126.2 Graduate Courses

#### IND R 701 Seminar in Industrial Relations Foundations

★3 (fi 6) (either term, 3-0-0).

#### IND R 702 Seminar in Industrial Relations Processes

★3 (fi 6) (either term, 3-0-0).

#### IND R 704 Individual Research

★3 (fi 6) (either term, 3-0-0).

## 211.127 Informatique

Faculté Saint-Jean

### INFOR 161 Introduction à l'informatique

★3 (fi 6) (l'un ou l'autre semestre, 3-0-3). L'utilisation d'un micro-ordinateur. L'ordinateur et ses applications: traitement de textes, graphique, tableur, base de données, transmission de données, etc. L'ordinateur et la société.

Quelques éléments de programmation. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour CMPUT 114, 157, 251, 300. La priorité sera accordée aux étudiants de la Faculté Saint-Jean. Anciennement INFOR 261.

#### **INFOR 261 Programmation pratique du micro-ordinateur**

★3 (*fi 6*) (deuxième semestre, 3-0-0). Etude des principes et des méthodologies nécessaires à la préparation des logiciels destinés aux micro-ordinateurs. Examen du concept de l'enseignement assisté par ordinateur. Rédaction et codification de programmes en employant le langage de programmation "C" et "tenCORE" et "le système "Authorware Professional." Prérequis: INFOR 161 ou l'équivalent.

### **211.128 Interdisciplinary Undergraduate Courses**

**Note:** Courses listed below are the concern of more than one discipline. Instruction will be offered by members of one or more of the departments or Faculties listed beneath the course description. For the following interdisciplinary courses, where the department responsible for registration has been assigned, the department so designated will appear in square brackets following the course description.

#### **211.128.1 Faculty of Agriculture, Forestry and Home Economics Courses**

##### **S INT D 303 Economics of World Agriculture**

★3 (*fi 6*) (either term, 3-0-0). Economic issues in international agriculture including world food security, farming systems, agricultural trade and aid. The role of agriculture in development and means of improving the performance of agriculture world-wide. Foreign domestic agricultural policies and international trade protection measures, and potential reforms in relation to Canadian agricultural interests. Prerequisite: ECON 101/102. (Offered jointly by the Departments of Economics and Rural Economy.) [Rural Economy]

##### **S INT D 356 Sociology of Rural Life**

★3 (*fi 6*) (either term, 3-0-0). The rural community and rural social systems, with special reference to changes in the rural way of life. Prerequisite: R SOC 355, or one of SOC 100, 202 or 300. (Offered jointly by the Departments of Rural Economy and Sociology.) [Rural Economy]

##### **S INT D 365 Natural Resource Economics**

★3 (*fi 6*) (either term, 3-0-0). Economics of natural resources related to agriculture and forestry; conservation, population, resource scarcity, property and tenure institutions, economic rent and resource pricing, resource development and evaluation, environmental protection, public resource policy. Prerequisite: ECON 101; ECON 102 recommended. Note: Not open to students with credit in ECON 365. (Offered jointly by the Departments of Rural Economy and Renewable Resources.) [Rural Economy]

##### **INT D 369 Economics of the Environment**

★3 (*fi 6*) (either term, 3-0-0). Economic growth and the deterioration of the environment; types and causes of environmental deterioration; theory, policy, and measurement relating to environmental deterioration; recreation economics; and current Canadian environmental topics. Prerequisite: ECON 101 or equivalent. (Offered jointly by the Departments of Economics and Rural Economy.) [Economics]

##### **S INT D 421 Peatlands**

★3 (*fi 6*) (first term, 3-0-3). Climatic, geologic and hydrologic factors of peatland development; ecosystem dynamics of peat formation including flora and fauna, biogeochemical cycles, and energy fluxes; stratigraphy and evolution; classification; utilization in forestry, agriculture, horticulture and as fuel. Two one-day field trips on Saturdays. Offered in alternate years. Prerequisites: A 100-level or higher ecology course and a 200-level Soils course. (Offered jointly by the Departments of Biological Sciences and Renewable Resources.) [Renewable Resources]

##### **INT D 455 Molecular Plant Development**

★3 (*fi 6*) (second term, 3-0-0). Recent advances in plant molecular biology will be introduced through a study of plant development at the molecular level. The course will examine how developmental processes can be used as model systems to study gene expression in higher plants. Both developmental regulation and stress induced alteration of gene expression will be covered using specific examples. Prerequisite: BOT 382 or PL SC 301. GENET 270 recommended. Offered in alternate years (Offered jointly by the Departments of Biological Sciences and Agricultural, Food, and Nutritional Science.) [Biological Sciences]

##### **INT D 456 Rural Social Problems and Public Policy**

★3 (*fi 6*) (either term, 3-0-0). Social problems in Canadian rural life; analysis of policy making processes related to these problems. Prerequisite: consent of Instructor; INT D 356 recommended. (Offered jointly by the Departments of Rural Economy and Sociology.) [Rural Economy]

##### **S INT D 465 Natural Resource Utilization**

★3 (*fi 6*) (either term, 3-0-0). Economics of utilizing and conserving land, water and energy resources in Agriculture and Forestry. Prerequisite: INT D 365. [Rural Economy]

##### **INT D 466 Principles of Heritage Interpretation**

★3 (*fi 6*) (either term, 3-0-0). Examination of heritage interpretation as an expression of cultural and environmental recreation programs. Prerequisite: consent of Instructor. (Offered jointly by the Departments of Renewable Resources and Recreation and Leisure Studies.) [Recreation and Leisure Studies]

##### **S INT D 551 Advanced Plant Biochemistry**

★3 (*fi 6*) (second term, 3-0-0). Selected topics in plant metabolism, with particular emphasis on mitochondrial electron transport, phosphorylation, and recent advances in carbon assimilation. Evaluation of current research and methods of investigation in these fields. Offered in alternate years. Prerequisites: PL SC 331 and 432 or consent of Instructor. (Offered jointly by the Departments of Biological Sciences and Agricultural, Food, and Nutritional Sciences.) [Agricultural, Food, and Nutritional Sciences]

##### **S INT D 565 Natural Resource and Environmental Economics**

★3 (*fi 6*) (either term, 3-0-0). Economic analysis of renewable resource and environmental issues. Renewable resource theory with applications to the fishery, forestry, soils and wildlife. Economic analysis of environmental protection and policy. Topics in applied benefit-cost analysis including the valuation of non-market goods and services. Prerequisites: consent of Instructor; AG EC 502 and 416 recommended. Offered jointly by the Departments of Rural Economy and Economics. [Rural Economy]

#### **211.128.2 Faculty of Arts Courses**

##### **Notes**

- (1) Courses listed below are the joint concern of the departments stated in the course descriptions. Instructions will be offered by members of one or more of the departments or Faculties listed. Responsibility for registration is with the department shown in square brackets at the end of the description.
- (2) Unless otherwise indicated in the course description, an INT D course may be applied toward either the major or the minor or as an option if it appears under the department's course listings.
- (3) Note that ★6 at the 400-level in INT D cannot constitute a minor in the BA (AR 20) program. Normally, a maximum of three units of course weight at the 400-level in INT D may be applied toward the minor requirement, unless otherwise approved by the minor department.

##### **S INT D 101 The Slavic World I**

★3 (*fi 6*) (first term, 3-0-0). Cultural developments in the Slavic lands from the early Middle Ages through Romanticism, with emphasis on literature and the fine arts. Trends such as the Renaissance, Baroque, Classicism and Romanticism will be examined. [Division of Slavic and East European Studies, Modern Languages and Comparative Studies]

##### **S INT D 102 The Slavic World II**

★3 (*fi 6*) (second term, 3-0-0). Cultural developments in the Slavic lands from the mid-19th century to the present, with emphasis on literature and the fine arts. Trends such as realism and modernism will be examined. [Division of Slavic and East European Studies, Modern Languages and Comparative Studies]

##### **INT D 120 Perspectives on Environment**

★3 (*fi 6*) (either term, 3-0-0). A multidisciplinary introduction to contemporary environmental problems, their sources, and practical and theoretical approaches to their resolution. [Anthropology]

##### **INT D 125 Topics in Interdisciplinary Studies**

★3 (*fi 6*) (either term, variable) or ★6 (*fi 12*) (full session, variable). Offered by various departments depending upon the content of the course in a given year. [Faculty of Arts]

##### **D INT D 200 Introduction to Studies in Science, Technology and Society**

★3 (*fi 6*) (either term, 3-0-0). An examination of the interrelations of science, technology, society and environment, emphasizing an interdisciplinary humanities and social sciences perspective. Both theoretical and practical issues will be addressed, using historical and contemporary case studies. [Department of History and Classics]

##### **INT D 225 Topics in Interdisciplinary Studies**

★3 (*fi 6*) (either term, variable) or ★6 (*fi 12*) (full session, variable). Offered by various departments depending upon the content of the course in a given year. [Faculty of Arts]

##### **INT D 257 Health Care Economics**

★3 (*fi 6*) (either term, 3-0-0). Resource allocation in the health care industry; production and cost relationships within various types of institutional settings (hospital, medical firm) the role of the price mechanism in allocating resources.

Manpower planning; the role of the Government and professional groups in allocating resources in the non-price sector of the health industry. (Offered jointly by the Departments of Economics and Public Health Sciences.) [Economics]

**S INT D 303 Economics of World Agriculture**

★3 (*fi 6*) (either term, 3-0-0). Economic issues in international agriculture including world food security, farming systems, agricultural trade and aid. The role of agriculture in development and means of improving the performance of agriculture worldwide. Foreign domestic agricultural policies and international trade protection measures, and potential reforms in relation to Canadian agricultural interests. Prerequisite: ECON 101/102. (Offered jointly by the Departments of Economics and Rural Economy). [Rural Economy]

**INT D 325 Topics in Interdisciplinary Studies**

★3 (*fi 6*) (either term, variable) or ★6 (*fi 12*) (full session, variable). Offered by various departments depending upon the content of the course in a given year. [Faculty of Arts]

**S INT D 331 Classical Thought**

★3 (*fi 6*) (either term, 3-0-0). An interdisciplinary approach to the study of the Ancient Greek and Roman World based on an investigation of philosophical and literary texts in English translation on some of the major topics of ancient thought such as polarity, the doctrine of the mean, individuality and responsibility, myth and philosophy, philosophy, and literary form. Prerequisite: Any term course in Classics or Philosophy. (Offered jointly by the Departments of History and Classics and Philosophy.) [History and Classics]

**S INT D 346 Introduction to Eastern Europe and the CIS**

★6 (*fi 12*) (full session, 3-0-0). An interdisciplinary introduction to the study of the socialist system with special reference to Eastern Europe and the Commonwealth of Independent States. (Offered jointly by the Departments of Economics, History and Classics, and Political Science.) [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree.

**S INT D 347 Women and Socialism**

★3 (*fi 6*) (either term, 3-0-0). Socialism in theory and practice: the status of women in Eastern Europe and in CIS (the Commonwealth of Independent States). Prerequisite: consent of Department of Modern Languages and Comparative Studies.

**INT D 350 Contemporary Germany: Political and Economic Aspects**

★3 (*fi 6*) (either term, 3-0-0). To be given in three four-week segments each by the Departments of History and Classics, Political Science, and Economics. [Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree.

**S INT D 356 Sociology of Rural Life**

★3 (*fi 6*) (either term, 3-0-0). The rural community and rural social systems, with special reference to changes in the rural way of life. Prerequisite: R SOC 355, or one of SOC 100, 202 or 300. (Offered jointly by the Departments of Rural Economy and Sociology.) [Rural Economy]

**INT D 369 Economics of the Environment**

★3 (*fi 6*) (either term, 3-0-0). Economic growth and the deterioration of the environment; types and causes of environmental deterioration; theory, policy, and measurement relating to environmental deterioration; recreation economics; and current Canadian environmental topics. Prerequisite: ECON 101 or equivalent. (Offered jointly by the Departments of Economics and Rural Economy.) [Economics]

**INT D 370 Survey on International Health**

★3 (*fi 6*) (second term, 3-0-0). Overview of health issues and organization in a cross-cultural context with emphasis on developing and newly industrialized countries. Prerequisite: Completion of 10 full courses in any program or consent of Instructor. (Nursing, Dentistry, Medicine, Pharmacy, Rehabilitation Medicine, and Social Sciences). [Nursing]

**D INT D 393 Political Sociology**

★3 (*fi 6*) (either term, 3-0-0). A study of how society affects politics and politics affects society. Discussion of the political consequences of economic developments, ideological debates, class conflicts, social movements, elites, gender, nationalisms and state structures. Focus on Canada from a comparative perspective. Prerequisite: POL S 100 or one of SOC 100, 202 or 300. (Offered jointly by the Departments of Political Science and Sociology.) [Political Science]

**S INT D 394 Introduction to Criminal Law**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: SOC 225. Note: Primarily for BA (Criminology) students. [Sociology]

**INT D 405 Sport and Popular Culture in Canada**

★3 (*fi 6*) (either term, 0-3S-0). An interdisciplinary examination of the place of sport in English- and French-Canadian popular culture, historically and in

the present. Topics include: the continental dimension of professional sport, and its effects on how Canadians see themselves; contemporary issues in community level sport, sport and nationalism; and Canadian governments' use of sport. (Offered jointly by the (Canadian Studies Program) Department of Political Science and the Faculty of Physical Education and Recreation.) [Political Science]

**INT D 425 Topics in Interdisciplinary Studies**

★3 (*fi 6*) (either term, variable) or ★6 (*fi 12*) (full session, variable). Offered by various departments depending upon the content of the course in a given year. [Faculty of Arts]

**INT D 439 Ukrainian Dance**

★3 (*fi 6*) (either term, 3-0-0). A theoretical and experiential investigation of the forms and history of Ukrainian dance. Course content is focused on the relationships of this dance to Ukrainian as well as Canadian culture, with consideration to its artistic and educational aspects. Offered jointly by the Faculty of Physical Education and Recreation and the Department of Modern Languages and Comparative Studies. [Faculty of Physical Education and Recreation]

**S INT D 443 Circumpolar Russia and Siberia**

★3 (*fi 6*) (either term, 3-0-0). The exploration of a variety of aspects of Siberia and the Russian North. It will include the geography and ecology of this sector of the circumpolar regions, their prehistory from the earliest human occupation until the times of Russian colonization, the history of Russian expansion into Siberia, the ethnography of aboriginal circumpolar peoples as well as their political and economic development within the Soviet Union and its successor states. Prerequisite or corequisite: An area-related course in one of Geography, Political Science, Economics, or consent of Departments of Anthropology or Modern Languages and Comparative Studies. (Other participating units normally include the Departments of Economics, and Political Science. Offered jointly by the Departments of Anthropology and Modern Languages and Comparative Studies.) [Division of Slavic and East European Studies, Modern Languages and Comparative Studies.]

**S INT D 444 Ukraine**

★3 (*fi 6*) (either term, 3-0-0). Major social, economic, political, and cultural trends in Ukrainian in the post-World War II period. Prerequisite or corequisite: An area-related three-weight course in one of geography, history, political science, or Ukrainian, or consent of Department of Modern Languages and Comparative Studies. (Other participating units normally include the Canadian Institute of Ukrainian Studies and the Department of History and Classics). [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree.

**S INT D 445 Poland**

★3 (*fi 6*) (either term, 3-0-0). The political, social, economic, and cultural developments in post World War II Poland. Prerequisite: INT D 346, or POLSH 202, or equivalent, or demonstration to the Department of Modern Languages and Comparative Studies of sufficient background in the area. (Other participating units normally include the Department of Economics.) [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree.

**S INT D 447 Soviet and Post-Soviet Political Thought**

★3 (*fi 6*) (either term, 3-0-0). Consideration of Russian, Soviet, and Post-Soviet critical political thought, and current discussions in the Soviet Union and its successor states and abroad on a wide range of political topics, from the organization of state power, interpretations of the history of the Soviet Union and its successor states and their ideology, to people's rights and freedoms, to nationality issues, and other current political problems. (Offered jointly by the Departments of Political Science and Modern Languages and Comparative Studies). [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Prerequisite: A course in the Slavic and East European Area Studies program, or permission of instructor. Note: Not to be taken by students with credit in INT D 447 (Soviet Dissent).

**S INT D 451 Geography of Recreation and Leisure**

★3 (*fi 6*) (either term, 3-0-0). Geographic research on outdoor recreation; behavioral-spatial approaches to participation and conflict in resource use, social and ecological carrying capacity, recreation space management. Prerequisite: consent of Instructor. (Offered jointly by the Departments of Earth and Atmospheric Sciences and the Faculty of Physical Education and Recreation). [Earth and Atmospheric Sciences]

**INT D 456 Rural Social Problems and Public Policy**

★3 (*fi 6*) (either term, 3-0-0). Social problems in Canadian rural life; analysis of policy making processes related to these problems. Prerequisite: consent of Instructor; INT D 356 recommended. (Offered jointly by the Departments of Rural Economy and Sociology.) [Rural Economy]

**S INT D 475 The Family in Socio-Historical Perspective**

★3 (*fi 6*) (either term, 3-0-0). Comparative study of the family in socio-historical context with emphasis on North American and European family

systems. Critical examination of contemporary sociological family theory in relation to historical data. Issues in socio-historical research methods of family study. Prerequisite: SOC 271 or equivalent. (Offered jointly by the Departments of History and Classics and Sociology). [Sociology]

**INT D 479 Honors Thesis**

★3 (*fi 6*) (variable, 3-0-0). Directed Honors thesis research. Note: Required of all BA (Honors) Students majoring in Modern Languages and Comparative Studies who are in their final year of study. [Division of Slavic and East European Studies, Modern Languages and Comparative Studies]

**S INT D 487 Topics in East European Studies**

★3 (*fi 6*) (either term, 3-0-0). Specific topics in the history of the countries of the former USSR taught by the Stuart Ramsay Tompkins Visiting Historian from Russia or another country of the former Soviet Union. Prerequisite: consent of Department. [Division of Slavic and East European Studies, Modern Languages and Comparative Studies]

**S INT D 498 Historiography of Science and Technology: Problems and Methods**

★3 (*fi 6*) (either term, 0-3s-0). (Offered jointly by the Departments of History and Classics and Philosophy.) [History and Classics]

**S INT D 499 Conference Course (Slavic and Eastern European Area Studies)**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Seminar for advanced students in Modern Languages and Comparative Studies designed to introduce fundamental questions in the field. [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree. Prerequisite: consent of Department.

**INT D 519 Application of Modern Literary Theory to Text Analysis**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Course taught in English. Text samples, however, will be taken from German literature and students will therefore require at least a reading knowledge of German. [Modern Languages and Comparative Studies]

**INT D 520 Combined Honors Essay**

★3 (*fi 6*) or ★6 (*fi 12*) (either or both terms). For students in Combined Honors programs. Permission of both Departments is required.

**S INT D 546 East European and Soviet and Post-Soviet Studies**

★6 (*fi 12*) (full session, 3-0-0). An interdisciplinary seminar. (Offered jointly by the Departments of Modern Languages and Comparative Studies, Economics, History and Classics, and Political Science.) [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree.

**INT D 554 Research in Cognitive Science**

★3 (*fi 6*) (either term, 3-0-0). A multidisciplinary survey of theoretical issues and research practices in Cognitive Science to be taught by various members of such Departments as Psychology, Computing Science, Linguistics, and Philosophy. Prerequisites: consent of course coordinator and consent of student's home department. [Psychology]

**INT D 593 Political Sociology**

★3 (*fi 6*) (either term, 0-3s-0). (Offered jointly by Political Science and Sociology) [Sociology]

**INT D 597 China-Japan Comparative Perspectives**

★3 (*fi 6*) (either term, 0-3S-0). A seminar in Chinese/Japanese studies. [East Asian Studies]

**INT D 598 Topics in East Asian Research**

★3 (*fi 6*) (either term, 0-3s-0). An interdisciplinary inquiry into the culture, history, economics and politics in East Asia (China, Japan, Korea). (Anthropology, History and Classics, Political Science, and Modern Languages and Comparative Studies.) [East Asian Studies]

**INT D 599 Topics in East Asian Studies: Directed Research Project in East Asian Studies**

★6 (*fi 12*) (full session, variable) Note: East Asian Studies INT D 599 is the course number assigned to graduate students in the East Asian Studies MA Program who take any 400-level University of Alberta course with East Asian content other than CHINA and JAPAN courses. Permission of the instructor required. May be repeated for credit when course content differs. (Anthropology, History and Classics, Political Science, and Modern Languages and Comparative Studies.) [East Asian Studies]

**INT D 654 Advanced Topics in Cognitive Science**

★3 (*fi 6*) (either term, 3-0-0). An intensive investigation of selected issues in Cognitive Science, such as mind/body relations, symbolic vs connectionist approaches, intentionality, and computational vs empirical research strategies. Prerequisites: INT D 554, consent of course instructor, and consent of student's home department. [Psychology]

## 211.128.3 Faculty of Law Courses

**INT D 468 Principles of International Humanitarian Law**

★3 (*fi 6*) (either term, 3-0-0). Historical background; humanitarian intervention; human rights; law of war; international criminal law. Prerequisite: consent of Faculty of Law or Department of Political Science. [Political Science]

## 211.128.4 Faculty of Medicine and Oral Health Sciences Courses

**INT D 224 Basic Virology**

★3 (*fi 6*) (first term, 3-0-0). An introduction to the structure, replication, and taxonomy of bacteriophages, plant, insect, and animal viruses. Their role in disease and methods of control and detection will also be discussed. Prerequisite: BIOL 107. Corequisite: BIOL 201 or 207. Credit may be obtained in only one of MICRB 224 or MMI 224 or INT D 224. May not be taken for credit if credit already obtained in BIOCH 450. (Offered jointly by the Departments of Biological Sciences and of Medical Microbiology and Immunology). [Medical Microbiology and Immunology]

**INT D 370 Survey on International Health**

★3 (*fi 6*) (second term, 3-0-0). Overview of health issues and organization in a cross-cultural context with emphasis on developing and newly industrialized countries. Prerequisite: Completion of 10 full courses in any program or consent of Instructor. (Nursing, Dentistry, Medicine, Pharmacy and Pharmaceutical Sciences, Rehabilitation Medicine, and Social Sciences). [Nursing]

**INT D 371 Introduction to Immunology**

★3 (*fi 6*) (first term, 3-0-0). This will be a survey course introducing the student to immunological concepts. Topics covered will include the clonal selection theory, antibody structure and specificity, genetic basis of immune diversity, antibody-antigen reactions, cell interactions in immune responses, the molecular basis of non-self recognition, MHC molecules and transplantation, tolerance, effector mechanism of immunity, hypersensitivity and immuno-deficiency. Prerequisites: BIOCH 203 and 205, and BIOL 207 or ZOOL 242. Credit may be obtained in only one of IMMUN 370 or MICRB 370 or INT D 371. (Offered jointly by the Department of Biological Sciences and the Department of Medical Microbiology and Immunology). [Biological Sciences]

**INT D 372 Immunology Laboratory Techniques**

★3 (*fi 6*) (first term, 0-0-6). Laboratory exercises to demonstrate quantitation of the immune response and the isolation and characterization of antigens. Characterization of cells of the immune system and their functions. Prerequisites: IMMUN 370 or MICRB 370 or INT D 371. Credit may be obtained in only one of IMMUN 405 or MICRB 371, or INT D 372. (Offered jointly by the Departments of Biological Sciences and Medical Microbiology and Immunology) [Biological Sciences]

**INT D 409 Research Project**

★3 (*fi 6*) (second term, 0-0-6). Directed research in a medical laboratory science. Supervisor and research project to be chosen by student. Requires writing a project proposal, keeping an accurate laboratory notebook, conducting adequate experimental research, writing a research paper and presenting a short seminar based on the research. Restricted to fourth-year Medical Laboratory Science students. (Offered jointly by the Department of Medical Microbiology and Immunology, and the Division of Medical Laboratory Science.)

**INT D 410 Team Building and Ethics in Health Care**

★3 (*fi 6*) (either term, 0-3s-0). A problem-based-learning course intended to provide experience in building a team of health care professionals from different disciplines. Emphases are placed on team building, upon unique contributions of different professions, and upon ethics. (Offered jointly by the following Faculties: Nursing, Dentistry, Agriculture, Forestry and Home Economics, Medicine, Pharmacy, Physical Education and Recreation, and Rehabilitation Medicine). (Priority will be given to students enrolled in the above Health Science Faculties). [Nursing]

**INT D 452 Advanced Immunology**

★3 (*fi 6*) (second term, 3-1s-0). A lecture course on the detailed mechanisms of the immune system, describing recent discoveries in cellular and molecular immunology. Topics include: mechanisms of T-cell receptor selection, antigen processing, activation of B and T lymphocytes, cellular collaboration, negative and positive regulatory mechanisms in immunity, transplantation, cytokine actions and interactions, autoimmunity. Interaction between immune systems and pathogens, and immunogenetics. Prerequisites: BIOCH 203 and 205 and IMMUN 370 or MICRB 370 or INT D 371. Credit may be obtained in only one of IMMUN 451 or MICRB 451 or INT D 452. (Offered jointly by the Department of Biological Sciences and the Department of Medical Microbiology). [Biological Sciences]

**INT D 491 Research Project**

★6 (*fi 12*) (full session, 0-0-6). Directed research in a medical laboratory science. Supervisor and research project to be chosen by student. Requires writing a

project proposal, keeping an accurate laboratory notebook, conducting adequate experimental research, writing a research paper and presenting a short seminar based on the research. Restricted to fourth-year Medical Laboratory Science students. (Offered jointly by the Department of Medical Microbiology and Immunology, and the Division of Medical Laboratory Science.)

#### **INT D 501 A Systematic Approach to Achieving Health**

★3 (fi 6) (first term, 1-2s-0). This course will focus on changing concepts of health, health determinants, and the health care system. Emphasis will be given to health models, role of participants in the health care system, and opportunities that exist for interdisciplinary partnerships and collaboration. Interdisciplinary lecture and seminar course offered by the Centre for Health Promotion Studies for the proposed Diploma/Master's degree programs in Health Promotion

#### **INT D 543 Current Problems in Neuroendocrinology**

★3 (fi 6) (second term, 3-0-0). Discussion of selected topics in neuroendocrinology. Credit for this course may be obtained more than once. Offered alternate years. Prerequisite: ZOO 343 or PHYS 401. [Physiology]

#### **INT D 544 Physiology of Reproduction**

★3 (fi 6) (either term, 3-0-0). Prerequisites: ZOO 343 or PHYS 401. [Biological Sciences]

#### **INT D 570 Healthcare Ethics**

★3 (fi 6) (either term, 3-0-0) An interdisciplinary course which will explore selected topics in bioethics. Included will be examination of ethical theories and principles within the context of clinical practice (nursing, medicine, rehabilitation medicine, dentistry, pharmacy), and learning experiences to improve moral reasoning and ethical decision making. Prerequisite: consent of Instructors. [Faculty of Nursing, Faculty of Medicine and Oral Health Sciences, Division of Bioethics]

### 211.128.5 Faculties of Agriculture, Forestry and Home Economics; Medicine and Oral Health Sciences; Nursing; Pharmacy and Pharmaceutical Sciences; and Rehabilitation Medicine

#### **INT D 370 Survey on International Health**

★3 (fi 6) (second term, 3-0-0). Overview of health issues and organization in a cross-cultural context with emphasis on developing and newly industrialized countries. Prerequisite: Completion of 10 full courses in any program or consent of Instructor. (Nursing, Dentistry, Medicine, Pharmacy and Pharmaceutical Sciences, Rehabilitation Medicine, and Social Sciences). [Nursing]

#### **INT D 410 Team Building and Ethics in Health Care**

★3 (fi 6) (either term, 0-3s-0). A problem-based-learning course intended to provide experience in building a team of health care professionals from different disciplines. Emphases are placed on team building, upon unique contributions of different professions, and upon ethics. (Offered jointly by the following Faculties: Agriculture, Forestry and Home Economics; Dentistry; Medicine; Nursing, Pharmacy and Pharmaceutical Sciences; Physical Education and Recreation; and Rehabilitation Medicine). (Priority will be given to students enrolled in the above Health Science Faculties). [Nursing]

#### **INT D 502 Health Promotion Practicum**

★3 (fi 6) (full term, 0-1s-7c). This course provides an opportunity for the student to work as part of an interdisciplinary team or a particular component of a health promotion project in the community. Normally, students will possess an academic background enabling them to assume responsibilities for planning and implementing interdisciplinary health promotion activities. Prerequisite: INT D 501.

#### **INT D 570 Healthcare Ethics**

★3 (fi 6) (either term, 3-0-0). An interdisciplinary course which will explore selected topics in bioethics. Included will be examination of ethical theories and principles within the context of clinical practice (nursing, medicine, rehabilitation medicine, dentistry, pharmacy), and learning experiences to improve moral reasoning and ethical decision making. (Prerequisite: consent of Instructors) [Faculty of Nursing, Faculty of Medicine and Oral Health Sciences, Division of Bioethics]

### 211.128.6 Faculty of Physical Education and Recreation Courses

#### **INT D 405 Sport and Popular Culture in Canada**

★3 (fi 6) (either term, 0-3s-0). An interdisciplinary examination of the place of sport in English- and French-Canadian popular culture, historically and in the present. Topics include: the continental dimension of professional sport, and its effects on how Canadians see themselves; contemporary issues in community level sport, sport and nationalism; and Canadian governments' use of sport. (Offered jointly by the (Canadian Studies Program) Department of Political Science and the Faculty of Physical Education and Recreation.) [Political Science]

#### **INT D 410 Team Building and Ethics in Health Care**

★3 (fi 6) (either term, 0-3s-0). A problem-based-learning course intended to provide experience in building a team of health care professionals from different disciplines. Emphases are placed on team building, upon unique contributions of different professions, and upon ethics. [Offered jointly by the following faculties: Nursing; Dentistry; Agriculture, Forestry and Home Economics; Medicine; Pharmacy and Pharmaceutical Sciences; Physical Education and Recreation; and Rehabilitation Medicine]. (Priority will be given to students enrolled in the above Health Science Faculties). [Nursing]

#### **INT D 439 Ukrainian Dance**

★3 (fi 6) (either term, 3-0-0). A theoretical and experiential investigation of the forms and history of Ukrainian dance. Course content is focused on the relationships of this dance to Ukrainian as well as Canadian culture, with consideration to its artistic and educational aspects. Offered jointly by the Faculty of Physical Education and Recreation and the Department of Modern Languages and Comparative Studies. [Faculty of Physical Education and Recreation]

#### **INT D 451 Geography of Recreation and Leisure**

★3 (fi 6) (either term, 3-0-0). Geographic research on outdoor recreation; behavioral-spatial approaches to participation and conflict in resource use, social and ecological carrying capacity, recreation space management. Prerequisite: consent of Instructor. (Offered jointly by the Department of Earth and Atmospheric Sciences and the Faculty of Physical Education and Recreation). [Earth and Atmospheric Sciences]

### 211.128.7 Faculty of Science Courses

**Note:** Any Interdisciplinary Studies courses below will be counted as a science course in a program of study in the Faculty of Science.

#### **INT D 224 Basic Virology**

★3 (fi 6) (first term, 3-0-0). An introduction to the structure, replication, and taxonomy of bacteriophages, plant, insect, and animal viruses. Their role in disease and methods of control and detection will also be discussed. Prerequisite: BIOL 107. Corequisite: BIOL 201 or 207. Credit may be obtained in one of MICRB 224 or MMI 224 or INT D 224. May not be taken for credit if credit already obtained in BIOCH 450. (Offered jointly by the Departments of Biological Sciences and of Medical Microbiology and Immunology) [Biological Sciences]

#### **INT D 371 Introduction to Immunology**

★3 (fi 6) (first term, 3-0-0). This will be a survey course introducing the student to immunological concepts. Topics covered will include the clonal selection theory, antibody structure and specificity, genetic basis of immune diversity, antibody-antigen reactions, cell interactions in immune responses, the molecular basis of non-self recognition, MHC molecules and transplantation, tolerance, effector mechanism of immunity, hypersensitivity and immunodeficiency. Prerequisites: BIOCH 203 and 205, and BIOL 207. Credit may be obtained in only one of IMMUN 370 or MICRB 370 or INT D 371. (Offered jointly by the Department of Biological Sciences and the Department of Medical Microbiology and Immunology). [Biological Sciences]

#### **INT D 372 Immunology Laboratory Techniques**

★3 (fi 6) (first term, 0-0-6). Laboratory exercises to demonstrate quantitation of the immune response and the isolation and characterization of antigens. Characterization of cells of the immune system and their functions. Prerequisites: IMMUN 370 or MICRB 370 or INT D 371. Credit may be obtained in only one of IMMUN 405 or MICRB 371, or INT D 372. (Offered jointly by the Departments of Biological Sciences and Medical Microbiology and Immunology) [Biological Sciences]

#### **INT D 421 Peatlands**

★3 (fi 6) (first term, 3-0-3). Climatic, geologic and hydrologic factors of peatland development; ecosystem dynamics of peat formation including flora and fauna, biogeochemical cycles, and energy fluxes; stratigraphy and evolution; classification; utilization in forestry, agriculture, horticulture and as fuel. Two one-day field trips on Saturdays. Offered in alternate years. Prerequisites: A 100-level or higher Ecology course and a 300-level Soils course. (Offered jointly by the Departments of Biological Sciences and Renewable Resources.) [Renewable Resources]

#### **INT D 452 Advanced Immunology**

★3 (fi 6) (second term, 3-1s-0). A lecture course on the detailed mechanisms of the immune system, describing recent discoveries in cellular and molecular immunology. Topics include: mechanisms of T-cell receptor selection, antigen processing, activation of B and T lymphocytes, cellular collaboration, negative and positive regulatory mechanisms in immunity, transplantation, cytokine actions and interactions, autoimmunity. Interaction between immune systems and pathogens, and immunogenetics. Prerequisites: BIOCH 203 and 205 and IMMUN 370 or MICRB 370 or INT D 371. Credit may be obtained in only one of IMMUN 451 or MICRB 451 or INT D 452. (Offered jointly by the Department of Biological Sciences and the Department of Medical Microbiology). [Biological Sciences]

**INT D 455 Molecular Plant Development**

★3 (*fi 6*) (second term, 3-0-0). Recent advances in plant molecular biology will be introduced through a study of plant development at the molecular level. The course will examine how developmental processes can be used as model systems to study gene expression in higher plants. Both developmental regulation and stress induced alteration of gene expression will be covered using specific examples. Prerequisite: BOT 382 or PL SC 301. GENET 270 recommended. Offered in alternate years (Offered jointly by the Departments of Biological Sciences and Agricultural, Food, and Nutritional Science.) [Biological Sciences]

**211.129 Interdisciplinary Graduate Courses**

**Note:** The following undergraduate courses may be taken for credit by graduate students: INT D 456, 458, 460, 465, 467, 486.

**INT D 543 Current Problems in Neuroendocrinology**

★3 (*fi 6*) (second term, 3-0-0). Discussion of selected topics in neuroendocrinology. Credit for this course may be obtained more than once. Offered alternate years. Prerequisite: ZOO 343 or PHYS 401.

**INT D 544 Physiology of Reproduction**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: ZOO 343, or PHYS 401. [Biological Sciences]

**INT D 546 East European Soviet and Post-Soviet Studies**

★6 (*fi 12*) (full session, 3-0-0). An interdisciplinary seminar. (Offered jointly by the Departments of Modern Languages and Comparative Studies, Economics, History and Classics, Political Science, Sociology.) [Division of Slavic and East European Studies, Modern Languages and Comparative Studies] Note: This course will not fulfil the Language other than English requirement of the BA degree.

**S INT D 551 Advanced Plant Biochemistry**

★3 (*fi 6*) (second term, 3-0-0). Selected topics in plant metabolism, with particular emphasis on mitochondrial electron transport, phosphorylation, and recent advances in carbon assimilation. Evaluation of current research and methods of investigation in these fields. Offered in alternate years. Prerequisites: PL SC 331 and 432 or consent of Instructor. (Offered jointly by the Departments of Biological Sciences and Agricultural, Food, and Nutritional Science.) [Agricultural, Food, and Nutritional Science]

**S INT D 565 Natural Resource and Environmental Economics**

★3 (*fi 6*) (either term, 3-0-0). Economic analysis of renewable resource and environmental issues. Renewable resource theory with applications to the fishery, forestry, soils and wildlife. Economic analysis of environmental protection and policy. Topics in applied benefit-cost analysis including the valuation of non-market goods and services. Prerequisite: consent of Instructor; AG EC 502 and 416 recommended. Offered jointly by the Departments of Rural Economy and Economics. [Rural Economy]

**INT D 566 Resource Economics II: Economics of the Environment**

★3 (*fi 6*) (either term, 3-0-0). Economic theory and policy relating to resource and environmental quality problems; welfare and public policy issues in resource decision-making; the relationships between economic growth and environmental preservation; externalities and public goods; economics of pollution; recreation economics; selected Canadian environmental issues. [Economics]

**INT D 593 Seminar in Political Sociology**

★3 (*fi 6*) (either term, 0-3s-0).

**INT D 594 Quaternary Environments**

★6 (*fi 12*) (full session, 3-0-0). A comprehensive survey of the Quaternary period; dating methods, paleoclimates, vertebrates, case studies in stratigraphy and paleoecology. Prerequisite: a related 400-level course in Anthropology, Biological Sciences, Earth and Atmospheric Sciences, Renewable Resources, or consent of Department. (Offered jointly by the Departments of Anthropology and Earth and Atmospheric Sciences.)

**211.130 Reserved****211.131 Italian**

(Division of Romance Languages, Literatures, and Linguistics)  
Department of Modern Languages and Comparative Studies  
Faculty of Arts

**Note:** For additional courses related to Italian, see Romance Linguistics and Romance Literature listings.

**211.131.1 Undergraduate Courses****ITAL 100 Beginners' Italian**

★6 (*fi 12*) (full session, 3-0-2). Italian grammar and pronunciation. Readings

of easy texts dealing with different aspects of Italian culture. Note: This course is not open to students having some previous knowledge of Italian or any of its dialects. See ITAL 150.

**ITAL 101 First-Year University Italian**

★6 (*fi 12*) (full session, 3-0-0). Designed for students having some previous knowledge of Italian. Note: Not open to students having credit in ITAL 100. Formerly ITAL 200 and 150.

**S ITAL 250 Second-Year Italian**

★6 (*fi 12*) (either term, 3-0-0). Selected contemporary prose and poetry. Advanced grammar and phonetics. Prerequisite: ITAL 100, 150 or equivalent. Formerly ITAL 300.

**S ITAL 331 Contemporary Italian Short Stories, Before 1945**

★3 (*fi 6*) (either term, 3-0-0). Selection of representative major writers. Prerequisite: ITAL 250 or consent of Department.

**S ITAL 332 Contemporary Italian Short Stories, Post-Second World War**

★3 (*fi 6*) (either term, 3-0-0). Selection of representative major writers. Prerequisite: ITAL 250 or consent of Department.

**S ITAL 363 Studies in Italian Literary Genres**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: ITAL 250 or consent of Department.

**S ITAL 375 Studies in Modern Italian Literature**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: ITAL 250 or consent of Department.

**S ITAL 394 Composition I**

★3 (*fi 6*) (either term, 3-0-0). This course is designed to improve students' command of Italian through intensive practice. Prerequisite: ITAL 250 or consent of Department.

**S ITAL 395 Composition II**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: ITAL 250, or consent of Department.

**S ITAL 415 Studies in Italian Renaissance Literature**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: A 300-level course in Italian literature or consent of Department.

**S ITAL 419 Selected Topics in Italian Literature**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: A 300-level course in Italian literature or consent of Department.

**S ITAL 425 Translation**

★3 (*fi 6*) (either term, 3-0-0). Literary and technical translation from English to Italian. Prerequisite: ITAL 250, or 394, or 395, or consent of Department.

**ITAL 499 Directed Reading**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Designed to meet the needs of individual students. Prerequisite: consent of Department.

**211.131.2 Graduate Courses****ITAL 501 Teaching Strategies for the Instruction of Italian**

★0 (*fi 1*) (either term).

**ITAL 505 Topics in Italian Medieval Literature**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Prerequisite: consent of Department.

**ITAL 525 Topics in Italian Renaissance Literature**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Prerequisite: consent of Department.

**ITAL 545 Topics in Italian Literature of the 17th and 18th Centuries**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Prerequisite: consent of Department.

**ITAL 565 Topics in 19th-Century Italian Literature**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Prerequisite: consent of Department.

**ITAL 575 Topics in 20th-Century Italian Literature**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). Prerequisite: consent of Department.

**ITAL 599 Conference Course**

★3 (*fi 6*) (either term, 3-0-0) or ★6 (*fi 12*) (full session, 3-0-0). A detailed study of some great author or question not dealt with in other Honors or Graduate courses. Designed to meet the needs of individual Honors or Graduate students. Prerequisite: consent of Department.

**211.132 Japanese**

Department of East Asian Studies  
Faculty of Arts

**Notes**

(1) There are two routes for embarking upon the study of the Japanese language. One is the intensive route in which both JAPAN 100 and 200 are taken in sequence over the period of one school year. (Note: both JAPAN 100 and 200 are six weight courses.) The other route is

non-intensive beginning with JAPAN 101 and 102 (or 207 and 208 which are specially designed for those students with a background in Chinese language) and followed by JAPAN 201 and 202. Those students wishing to major in Japanese are strongly encouraged to take the intensive route.

- (2) JAPAN 100, 101, 102, 150, 200, 201, 202, 215, 250, 301, 302, 305, 306, 315, 350, 401, 402, 405, 406, 425, 426, 451, 452, 481, and 482 are designed for students whose first language is not Japanese.
- (3) For students with knowledge of Japanese, departmental counselling and placement is required.

The following table lists renumbered courses effective 1990/91:

Old	New	Old	New
JAPAN 201	JAPAN 151	JAPAN 325	JAPAN 225
JAPAN 202	JAPAN 152	JAPAN 326	JAPAN 226
JAPAN 300	JAPAN 200	JAPAN 350	JAPAN 250
JAPAN 301	JAPAN 201	JAPAN 351	JAPAN 301
JAPAN 302	JAPAN 202	JAPAN 352	JAPAN 302
JAPAN 307	JAPAN 207	JAPAN 405	JAPAN 451
JAPAN 308	JAPAN 208	JAPAN 406	JAPAN 452
JAPAN 311	JAPAN 305	JAPAN 450	JAPAN 350
JAPAN 312	JAPAN 306		

#### **JAPAN 100 Intensive Basic Japanese I**

★6 (*fi 12*) (either term, 0-10L-0). An intensive course designed to develop basic skills in spoken and written Japanese. This course is equivalent to JAPAN 101 and 102. Note: Normally students proceed from JAPAN 100 to 200. Students with credit in Japanese 30 or 35 should consult the Department.

#### **JAPAN 101 Introductory Japanese I**

★3 (*fi 6*) (either term, 0-5L-0). A non-intensive course designed to develop basic skills in spoken and written Japanese. Note: JAPAN 100 and 101 may not both be taken for credit. Students with credit in Japanese 30 or 35 should consult the Department.

#### **JAPAN 102 Introductory Japanese II**

★3 (*fi 6*) (either term, 0-5L-0). A continuation of JAPAN 101. Prerequisite: JAPAN 101 or equivalent. Note: JAPAN 100 and 102 may not both be taken for credit.

#### **JAPAN 200 Intensive Basic Japanese II**

★6 (*fi 12*) (either term, 0-10L-0). A continuation of JAPAN 100. This course is equivalent to JAPAN 201 and 202. Prerequisite: JAPAN 100, or equivalent.

#### **JAPAN 201 Introductory Japanese III**

★3 (*fi 6*) (either term, 0-5L-0). A non-intensive course designed to develop further basic skills in spoken and written Japanese. Prerequisite: One of JAPAN 100, 102, 208 or equivalent. Note: JAPAN 200 and 201 may not both be taken for credit. JAPAN 201 and 202 together are roughly equivalent to JAPAN 200.

#### **JAPAN 202 Introductory Japanese IV**

★3 (*fi 6*) (either term, 0-5L-0). A continuation of JAPAN 201. Prerequisite: JAPAN 201. Note: JAPAN 200 and 202 may not both be taken for credit. JAPAN 201 and 202 are roughly equivalent to JAPAN 200.

#### **JAPAN 250 The Japanese Language in its Cultural Setting I**

★6 (*fi 12*) (Intersession abroad only, 0-15L-0). A language/culture immersion course to be studied in Japan. Designed for improvement of oral/aural skills and for increased understanding of Japanese people and culture. Note: Offered in alternate years. Prerequisite: JAPAN 200 or 202 or consent of Department.

#### **JAPAN 301 Intermediate Japanese I**

★3 (*fi 6*) (either term, 0-5L-0). Designed to develop basic reading skills of modern Japanese prose with special emphasis on grammar and usage. Prerequisite: JAPAN 200 or equivalent.

#### **JAPAN 302 Intermediate Japanese II**

★3 (*fi 6*) (either term, 0-5L-0). A continuation of JAPAN 301. Prerequisite: JAPAN 301 or equivalent.

#### **JAPAN 305 Intermediate Conversation and Composition I**

★3 (*fi 6*) (either term, 0-4L-0). Designed to be taken in conjunction with JAPAN 301 to develop speaking and writing skills of Japanese. Prerequisite: JAPAN 200, or 202, or consent of Department.

#### **JAPAN 306 Intermediate Conversation and Composition II**

★3 (*fi 6*) (either term, 0-4L-0). A continuation of JAPAN 305. Designed to be taken in conjunction with JAPAN 302. Prerequisite: JAPAN 305.

#### **JAPAN 321 Pre-Modern Japanese Literature in English Translation**

★3 (*fi 6*) (either term, 3-0-0). This course studies English translations of Japanese classics such as the Tale of Genji, Noh plays, the haiku of Basho, and the picaresque fiction of Saikaku. No prerequisite. Note: This course will not fulfill the Language other than English requirement of the BA degree.

#### **JAPAN 322 Modern Japanese Literature in English Translation**

★3 (*fi 6*) (either term, 3-0-0). This course studies English translations of major works in modern Japanese literature. Authors covered will include

Mishima, Kawabata, Soseki among others. No prerequisite. Note: This course will not fulfill the Language other than English requirement of the BA degree.

#### **JAPAN 350 The Japanese Language in its Cultural Setting II**

★6 (*fi 12*) (Intersession, abroad only 0-15L-0). A language/culture immersion course to be studied in Japan. Designed to improve oral/aural skills and increase understanding of Japanese people and culture. Note: Offered in alternate years. Prerequisite: JAPAN 302, or 306, or consent of Department.

#### **JAPAN 401 Advanced Japanese I**

★3 (*fi 6*) (either term, 4-0-0). An advanced course designed to develop skills in spoken and written Japanese with special emphasis on the acquisition of an extensive vocabulary. Prerequisite: JAPAN 302.

#### **JAPAN 402 Advanced Japanese II**

★3 (*fi 6*) (either term, 4-0-0). A continuation of JAPAN 401. Prerequisite: JAPAN 401 or equivalent.

#### **JAPAN 415 Haiku and the Japanese Poetic Tradition**

★3 (*fi 6*) (either term, 3-0-0). The course will discuss in English the evolution of haiku, the work of the great masters of the 17th and 18th centuries and modern haiku. Prerequisite: JAPAN 321 or any 300-level literature course. Note: This course will not fulfill the Language other than English requirement of the BA degree.

#### **JAPAN 416 Japanese Theatre from the Noh to the Avant-garde**

★3 (*fi 6*) (either term, 3-0-0). The course will discuss, in English, forms of Japanese drama from the Noh to modern theatre. Prerequisite: JAPAN 321 or any 300-level literature or drama course. Note: This course will not fulfill the Language other than English requirement of the BA degree.

#### **JAPAN 418 Women's Literature in Japan—Pre-Modern**

★3 (*fi 6*) (either term, 3-0-0). Selection of poetry, fiction, and diaries by women writers that occupy such an important place in the canon of classical Japanese literature will be read in English translation. Prerequisite: JAPAN 321 or any 300-level literature course. This course will not fulfill the language other than English requirement of the BA (AR20) degree. Note: Not open to students with credit in JAPAN 417.

#### **JAPAN 419 Women's Literature in Japan—Modern**

★3 (*fi 6*) (either term, 3-0-0). Selection of the rich body of literature created by modern Japanese women authors will be read in English translation. Prerequisite: JAPAN 321 or any 300-level literature course. This course will not fulfill the language other than English requirement of the BA (AR20) degree. Note: Not open to students with credit in JAPAN 417.

#### **JAPAN 420 The Modern Japanese Novel in English Translation**

★3 (*fi 6*) (either term, 3-0-0). This course will examine representative novels by modern Japanese writers in English translation with a focus on the evolution of major literary and aesthetic concerns of 20th-century Japanese fiction. Authors to be covered include Shiga, Tanizaki, Dazai, Ibuse, and others. Prerequisite: Japan 322 or any 300-level literature course. Note: This course will not fulfill the language other than English requirement of the BA degree.

#### **JAPAN 425 The Structure of the Japanese Language**

★3 (*fi 6*) (either term, 3-0-0). Discussion of the major linguistic features of the Japanese language. Lectures in English. Prerequisite: JAPAN 302 or consent of Department.

#### **JAPAN 426 The History of the Japanese Language**

★3 (*fi 6*) (either term, 3-0-0). The development of the Japanese language from its origin to the present. Lectures in English. Prerequisite: JAPAN 302 or consent of Department.

#### **JAPAN 451 Advanced Readings in Japanese I**

★3 (*fi 6*) (either term, 4-0-0). Advanced readings from newspapers, magazines, social commentary and literary prose. Prerequisite: JAPAN 402 or consent of Department.

#### **JAPAN 452 Advanced Readings in Japanese II**

★3 (*fi 6*) (either term, 4-0-0). A continuation of JAPAN 451. Prerequisite: JAPAN 451 or consent of Department.

#### **JAPAN 481 Supervised Reading in Japanese I**

★3 (*fi 6*) (either term, 3-0-0). Accelerated reading course primarily for senior and graduate students in special areas of need or interest. Prerequisite: consent of Department.

#### **JAPAN 482 Supervised Readings in Japanese II**

★3 (*fi 6*) (either term, 3-0-0). A continuation of JAPAN 481. Prerequisite: JAPAN 481.

#### **JAPAN 502 Methods of Research: Literature**

★3 (*fi 6*) (either term, 3-0-0). Theory and practice of historical and critical approaches to premodern and modern Japanese literature. A reading knowledge of Japanese is required.

#### **JAPAN 551 Topics in Japanese Classical and Modern Drama**

★3 (*fi 6*) (either term, 3-0-0). The course will discuss, in English, forms of Japanese drama from the Noh to modern theatre. A reading knowledge of Japanese is required.

**JAPAN 552 Topics in Japanese Women's Literature—Pre-Modern**

★3 (*fi 6*) (either term, 3-0-0). Selections of poetry, fiction, and diaries by women writers that contribute significantly to the canon of classical Japanese literature. A reading knowledge of Japanese is required.

**JAPAN 553 Topics in Japanese Women's Literature—Modern**

★3 (*fi 6*) (either term, 3-0-0). Selections of literature created by modern Japanese women authors. A reading knowledge of Japanese is required.

**JAPAN 554 Topics in Japanese Poetry**

★3 (*fi 6*) (either term, 3-0-0). This course will discuss the evolution of haiku, the work of the great 17th and 18th century masters, and modern haiku. A reading knowledge of Japanese is required.

**JAPAN 556 Topics in the Modern Japanese Novel**

★3 (*fi 6*) (either term, 3-0-0). This course will examine representative novels by modern Japanese writers with a focus on the evolution of major literary and aesthetic concerns of 20th-century Japanese fiction. Authors to be covered include Shiga, Tanizaki, Dazai, Ibuse, and others. A reading knowledge of Japanese is required.

**JAPAN 599 Topics in Japanese Literature, Pre-modern and Modern**

★3 (*fi 6*) (either term, 3-0-0). JAPAN 599 must be taken at least once and may be repeated for credit when course content differs. A reading knowledge of Japanese is required.

**211.133 Korean**

Department of East Asian Studies  
Faculty of Arts

**D KOREA 101 Introductory Korean I**

★3 (*fi 6*) (first term, 3-0-2). Designed to develop basic skills in spoken and written Korean. Note: Only one of KOREA 101 and 121 may be taken for credit.

**D KOREA 102 Introductory Korean II**

★3 (*fi 6*) (second term, 3-0-2). A continuation of KOREA 101. Prerequisite: KOREA 101 or equivalent. Note: Only one of KOREA 102 and 122 may be taken for credit.

**S KOREA 121 Conversational Korean I**

★3 (*fi 6*) (first term, 3-0-2). Designed to acquire basic phrases and a knowledge of Korean customs and culture. Note: Only one of KOREA 101 and 121 may be taken for credit.

**S KOREA 122 Introductory Korean II**

★3 (*fi 6*) (second term, 3-0-2). A continuation of KOREA 121. Prerequisite: KOREA 121 or equivalent. Note: Only one of KOREA 102 and 122 may be taken for credit.

**D KOREA 201 Intermediate Korean I**

★3 (*fi 6*) (first term, 3-0-2). A course designed to improve reading, speaking and writing. Prerequisite: KOREA 102, 122, or equivalent.

**D KOREA 202 Intermediate Korean II**

★3 (*fi 6*) (second term, 3-0-2). A continuation of Korea 201. Prerequisite: KOREA 201, or equivalent.

**D KOREA 301 Intermediate Korean III**

★3 (*fi 6*) (first term, 3-0-2). A course designed to enhance communication, comprehension, and composition through various reading materials and activities. Some Sino-Korean characters (Hahnja) will also be studied. Prerequisite: KOREA 202, or equivalent.

**D KOREA 302 Intermediate Korean IV**

★3 (*fi 6*) (second term, 3-0-2). A continuation of Korea 301. Prerequisite: KOREA 301, or equivalent.

**D KOREA 321 Pre-modern Korean Literature in English**

★3 (*fi 6*) (either term, 3-0-0). An introduction to pre-modern Korean literature. All readings and lectures in English. No prerequisites. Note: This course will not fulfil the Language other than English requirement of the BA degree.

**D KOREA 322 Modern Korean Literature in English**

★3 (*fi 6*) (either term, 3-0-0). An introduction to modern Korean literature. All readings and lectures in English. No prerequisites. Note: This course will not fulfil the Language other than English requirement of the BA degree.

**S KOREA 401 Advanced Korean I**

★3 (*fi 6*) (first term, 3-0-0). Studies in Korean language, culture and customs through readings and activities. Emphasis on sound patterns, grammatical structure, communication, comprehension, and composition. Prerequisite: KOREA 302 or equivalent.

**S KOREA 402 Advanced Korean II**

★3 (*fi 6*) (second term, 3-0-0). A continuation of KOREA 401. Prerequisite: KOREA 401 or equivalent.

**211.134 Laboratory Animal Management**

Department of Microbiology  
Faculty of Science

**LB AN 301 Experimental Animal Models**

★3 (*fi 6*) (second term, 3-0-3). This course will be directed to senior level (3rd and 4th year) undergraduate students with a background in vertebrate biology and an interest in animal based research. The course will assist the students in selecting appropriate experimental animal models for specific types of research. The advantages and limitations of animal models will be discussed, as well as the use of alternative and/or complementary non-animal models. The ethics of animal use will be emphasized throughout the course. Students will also be informed of the regulations and legislation governing the use of animals in Canada. Prerequisite: ZOOL 225 or 226.

**211.135 Latin**

Department of History and Classics  
Faculty of Arts

**Notes**

- (1) Prerequisite for all 400-level Latin courses: LATIN 300, or 302, or consent of Department.
- (2) For additional related courses see Classics and Greek listings.

**211.135.1 Undergraduate Courses****D LATIN 101 Beginners' Latin I**

★3 (*fi 6*) (either term, 3-0-1). An introduction to Latin which includes the study of the elements of Latin grammar and the reading of simple texts. Note: Students who have taken Latin 30 or equivalent should consult the Department advisor. Not open to students with credit in LATIN 100.

**D LATIN 102 Beginners' Latin II**

★3 (*fi 6*) (either term, 3-0-1). A continuation of LATIN 101. Prerequisite: LATIN 101, or consent of Department. Not open to students with credit in LATIN 100.

**D LATIN 103 Intensive Beginning Latin**

★6 (*fi 12*) (full session, 3-0-2). An introduction to Latin, including the elements of Latin grammar and the reading of simple texts. Not open to students who have successfully completed Latin 30, LATIN 100, 101, or 102. Normally offered during Intersession only.

**S LATIN 301 Intermediate Latin I**

★3 (*fi 6*) (either term, 3-0-1). Review of grammar; reading of Latin texts; translation of simple sentences from English into Latin. Prerequisite: LATIN 100, or 102, or consent of Department. Not open to students with credit in LATIN 300.

**S LATIN 302 Intermediate Latin II**

★3 (*fi 6*) (either term, 3-0-0). Selections from Latin poetry and prose. Prerequisite: LATIN 301 or consent of Department. Not open to students with credit in LATIN 300.

**S LATIN 399 Readings in Latin Authors**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: LATIN 300 or 301 or consent of Department.

**S LATIN 433 Medieval Latin**

★3 (*fi 6*) (either term, 0-3s-0). Prerequisite: Latin 300, 302, or consent of Department.

**S LATIN 470 Roman Historians**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 475 Roman Elegaic and Lyric Poetry**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 477 Roman Oratory**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 481 Roman Epic and Didactic Poetry**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 488 Latin Authors I**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 489 Latin Authors II**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 499 Individual Study in Latin Authors**

★3 (*fi 6*) (either term, 3-0-0).

**S LATIN 500 Fourth-Year Honors Tutorial**

★3 (*fi 6*) (either term, 0-3s-0). Prerequisite: consent of Department.

## 211.135.2 Graduate Courses

### LATIN 502 Latin Epic and Didactic Poetry

★3 (*fi 6*) (either term, 3-0-0).

### LATIN 506 Latin Poetry

★3 (*fi 6*) (either term, 3-0-0).

### LATIN 508 Latin Historiography

★3 (*fi 6*) (either term, 3-0-0).

### LATIN 510 Latin Prose Writers

★3 (*fi 6*) (either term, 3-0-0).

### LATIN 562 Topics in Latin Literature

★3 (*fi 6*) (either term, 0-3s-0). Prerequisite: consent of Department.

### LATIN 599 Supervised Reading

★3 (*fi 6*) (either term, 3-0-0).

### LATIN 601 Studies in Latin Authors

★3 (*fi 6*) (either term, 0-3s-0). Prerequisites: A Latin 400- or 500-level course and consent of Department.

### LATIN 699 Conference Course

★3 (*fi 6*) (either term, 3-0-0).

## 211.136 Latin American Studies

(Division of Romance Languages, Literatures, and Linguistics)

Department of Modern Languages and

Comparative Studies

Faculty of Arts

### LA ST 205 Central America and the Caribbean

★3 (*fi 6*) (either term, 3-0-0). Regional similarities and national differences. An introduction to Central America and the Caribbean today, including Spanish, French, and Creole speaking countries through study of their cultural contexts and forms of expression. Taught in English by the Department of Modern Languages and Comparative Studies in collaboration with the Departments of Art and Design, Anthropology, History and Classics, and Political Science.

### LA ST 210 South America

★3 (*fi 6*) (either term, 3-0-0). Regional similarities and national differences. An introduction to South America today, including Brazil and the Spanish speaking countries of the continent, through study of their cultural contexts and forms of expression. Taught in English by the Department of Modern Languages and Comparative Studies in collaboration with the Departments of Anthropology, Art and Design, History and Classics, and Political Science.

## 211.137 Law

Faculty of Law

### LAW 400 Introduction to Law

★2 (*fi 4*) (first term, 2-0-0). An introduction to the materials and techniques used in effective legal research. This course teaches the use and application of printed and electronic research tools relevant to each major common-law jurisdiction, with emphasis on Canada and Alberta. It aims at skill-building through a combination of lecture and micro lab presentations and individuals or groups 'hands-on' experiences. This legal research program is linked to the legal writing component of the Constitutional Law course.

### LAW 410 Contracts

★6 (*fi 12*) (full session, 3-0-0). A discussion of the prerequisites to the creation of contractual obligation: offer and acceptance, intention and certainty, consideration, the requirements of writing and capacity. The effect of misrepresentations and terms of the contract, together with the problems of exclusion clauses and of standard form contracts. Questions of discharge from contractual obligation on the grounds of mistake, undue influence, duress, unconscionable transactions and frustration. Remedies for breach of contract.

### LAW 420 Criminal Law and Procedure

★6 (*fi 12*) (full session, 3-0-0). A general introduction to the criminal law including pretrial procedures and practices; general substantive principles; criminal law and morality; trial procedure; double jeopardy; and sentencing.

### LAW 430 Torts

★6 (*fi 12*) (full session, 3-0-0). The law of negligence, damages, intentional interferences with persons, property and chattels, the law of strict liability, occupiers' liability, nuisance, defamation, the economic torts, the future of tort law.

### LAW 435 Constitutional Law and History

★6 (*fi 12*) (full session, 3-0-0). An introduction to the legal and constitutional

framework of the legislative, executive, and judicial branches of Canadian government and their interrelationships. The development of Canada's constitution from early colonial days to the present is examined as are the basic principles of Constitutional interpretation, the division of legislative jurisdiction between Parliament and provincial legislatures, and the Charter of Rights and Freedoms. Some emphasis is placed upon the court structure in Canada and the role of the judiciary, including a discussion of the doctrine of precedent. Students are also instructed in the basics of legal writing, including engaging in writing assignments and a moot court exercise.

### LAW 440 Property Law

★6 (*fi 12*) (full session, 3-0-0). This course involves the study of basic principles which govern the institution of real and personal property. Included in this analysis will be the history of property law and issues of social and political context. Other topics include right incident to the ownership and possession of land, tenures and estates, concurrent ownership, dower, leases and tenancies, easements, restrictive covenants, finders law, bailment, and gifts. Other special issues may be explored.

### LAW 450 Administrative Law

★4 (*fi 8*) (variable, 4-0-0). Designed to provide an understanding of the legal constraints courts have placed on the behavior of administrative tribunals and government departments. *Topics to be discussed:* What is Administrative Law? How the courts supervise the acts and decisions of administrative bodies. Pitfalls to be avoided by administrative officers: errors of fact and law; excesses of discretion; breach of natural justice. How administrative acts and decisions may be attacked by an aggrieved citizen: remedies. Appeal and review, time limits, locus standi, choice of remedy, procedure. How to avoid attacks by aggrieved citizens. The practical outcome; strength of review. Recent trends in Administrative Law in Canada.

### LAW 455 Administrative Law for Public Managers

★3 (*fi 6*) (either term, 3-0-0). Open to MPM students only.

### LAW 460 Taxation

★4 (*fi 8*) (variable, 4-0-0). The scope and purpose of taxation. The taxing power; tax appeal procedures; constitutional problem. Personal jurisdiction. Property jurisdiction. Income from a business; capital gains and losses; statutory interpretation, deductions, expenses. Gift tax.

### LAW 465 International Law

★3 (*fi 6*) (either term, 3-0-0). The major objective of the course is to provide an overview of the basic machinery through which international law operates together with a review of principles which regulate the conduct of nations in their connections with one another. Topics to be covered include: definition, nature and sources of international law and their application in Canadian courts; international personality; state jurisdiction; nationality and individuals; the law of treaties; state responsibility and international claims; and pacific settlement of international disputes.

### LAW 470 Advocacy

★2 (*fi 4*) (either term, 2-0-0). The conduct of civil litigation including: interviewing and counselling, drafting pleadings, examinations for discovery, settlement attempts, preparation for court and participation in a mock trial. Emphasis on ethics and techniques of persuasion. Advocacy before tribunals and boards. Prerequisites: Completion of LAW 570 and 575. However, LAW 570 may be a corequisite in both the first and second term.

### LAW 472 Techniques in Negotiation

★2 (*fi 4*) (either term, 2-0-0). An indepth analysis of the nature, purpose, and methodology of negotiation. Mock negotiations will be undertaken by the class. Mediation and arbitration will be discussed.

### LAW 474 Alternative Dispute Resolution

★2 (*fi 4*) (either term, 2-0-0). This course will provide students with an understanding of the breadth and scope of dispute resolution alternatives with a focus on how those alternative processes are being utilized in Alberta. The student will learn various forms of dispute resolution including client interviewing, negotiation, mediation, arbitration, med-arb, the mini-trial and litigation risk analysis. The course will also look at how alternate dispute resolution fits within the adversarial system, the benefits and drawbacks of each process and how to choose the most appropriate form.

### LAW 485 Family Law

★3 (*fi 6*) (either term, 3-0-0). The formation and annulment of marriage; various matrimonial remedies; judicial separation; alimony; loss of consortium; divorce; ground and procedure; custody of children; financial obligations and property rights between spouses.

### LAW 495 Research Paper

★2 (*fi 4*) (either term, 2-0-0). This program will give selected second year students an opportunity to engage in original research. The research topic is subject to prior approval of a Faculty member, who shall direct the students, and of the Associate Dean.

### LAW 498 Moot Court Competition

★2 (*fi 4*) (either term, 2-0-0). Selection to the Alberta Challenge Cup, Client Counselling Competition, Clinton J Ford Moot, Western Canada Trial Moot,

or other designated moot court competition team through a preliminary round competition, participation in training sessions in advocacy, criminal trial practice or interviewing and counselling, preparation of a factum, memorial or other written work, participation in final round competition.

**LAW 499 Seminars on Specialized Legal Topics**

★2 (*fi 4*) (either term, 0-2s-0). These seminars will cover a specialized topic of emerging importance in the law. The particular topic covered would vary dependent on the availability of Faculty with necessary teaching competence, student interest, and the needs of the legal profession.

**LAW 500 Jurisprudence**

★3 (*fi 6*) (either term, 3-0-0). An enquiry into the nature of law and legal obligation. The first part of the course is a survey of the major schools of jurisprudence with particular emphasis upon positivism, natural law and legal realism. The second part consists of an examination of the modern applications of these theories, especially in relation to the process of judicial decision making and the question of whether there is an obligation to obey the law.

**LAW 505 Legal History**

★3 (*fi 6*) (either term, 3-0-0). An introduction to the historical development of law, from early times to the present day.

**LAW 510 Company Law**

★4 (*fi 8*) (variable, 4-0-0). The law of partnerships, unincorporated associations, and limited liability companies. The incorporation of companies; relationships between the company and outsiders; and relationships of the members of the company within the corporate structure.

**LAW 513 Agency**

★2 (*fi 4*) (either term, 2-0-0). The relationship of Principal and Agent. Capacity of parties. Appointment of agents. Married women as agents of their husbands. Delegation. Agents binding their principals; actual authority; ostensible authority and holding out; ratification. Undisclosed principals. Duties of agent to principal. Duties of principal to agent. Determination of agency.

**LAW 514 Credit Transactions I**

★2 (*fi 4*) (first term, 2-0-0). A general view of unsecured creditor's rights and remedies, including prejudgment remedies, execution and attachment of debts; priorities among creditors.

**LAW 515 Sale of Goods**

★2 (*fi 4*) (either term, 2-0-0). The law of the sale of goods; nature of contract of sale, conditions and warranties implied by the Sale of Goods Act, passing of property and risk, documentary sales transactions, remedies of the buyer and the seller, circumstances under which a seller can pass a better title than he/she has.

**LAW 518 Intellectual Property**

★3 (*fi 6*) (either term, 3-0-0). A study of the law with respect to patents, trade marks, trade secrets, copyrights and intangible property generally.

**LAW 519 Insurance Law**

★3 (*fi 6*) (either term, 3-0-0). General principles affecting insurance contracts including good faith, indemnity, subrogation, and insurable interest; particular problems arising out of the Alberta Insurance Act in relation to automobile, life and fire insurance.

**LAW 520 Criminal Trial Procedure and Advocacy**

★3 (*fi 6*) (either term, 3-0-0). Practical aspects of criminal trial procedure and advocacy. Topics include: legal ethics; information and indictments; arrest and detention; judicial interim release; election and pleas; preliminary hearings; summary conviction appeals, jury trials; extraordinary remedies; miscellaneous problems in advocacy.

**LAW 522 The Law and Practice of Sentencing in Canada**

★3 (*fi 6*) (either term, 3-0-0). This course critically examines definitions of crime and criminality as well as social and legal responses to criminal behavior. Topics to be covered in this course include: the scope and methods of criminological and penological studies; definitions of crime; victims and victimology; gatekeepers in the judicial system (police discretion); the law and practice of sentencing; deterrence; incapacitation and dangerousness; alternatives to imprisonment; the prison system in Canada; parole; native offenders; female and young offenders. Note: Open to second and third year Law students.

**LAW 527 Law and Psychiatry**

★2 (*fi 4*) (either term, 2-0-0). The scope of psychiatry; classification and identification of specific psychiatric problems, with special reference to the legal, ethical and social implications of psychiatric illness and the practice of psychiatry; the way in which the study of psychiatry can be utilized in the practice of law.

**LAW 531 Law and Medicine**

★2 (*fi 4*) (either term, 2-0-0). Selected topics pertinent to law and medicine with an emphasis on the practical implications of the law for the medical profession and the effect of changes in medical practice and institutions on the law. Problems will be examined with assistance from professionals working in the relevant areas and recommendations for law reform will be sought.

**LAW 536 Civil Liberties**

★3 (*fi 6*) (either term, 3-0-0). An in-depth analysis and discussion of the Charter of Rights and Freedoms and the cases decided thereunder; the role of the judiciary and the legitimacy and scope of judicial review under the Charter; the protection afforded under the Constitution Act, 1867 (e.g. implied Bill of Rights, provisions regarding denominational guarantees), Canadian Bill of Rights, 1960, anti-discrimination laws (e.g. Canadian Human Rights Act, Individual Rights Protection Act), the Office of the Ombudsman, Freedom of Information legislation. All or some of the above will be discussed. Comparative materials will be studied where appropriate.

**LAW 540 Land Titles**

★3 (*fi 6*) (either term, 3-0-0). A detailed study of the Alberta Land Titles Act consisting of an analysis of the Common Law and Registry Systems of Conveyancing; Introduction to the Torrens System of Land Titles; The Principles of Indefeasibility; Exceptions to Indefeasibility; Boundary Problems; Caveats; Registrable Instruments; Miscellaneous Title Problems; The Assurance Fund; Limitations of Actions.

**LAW 543 Basic Oil and Gas Law**

★3 (*fi 6*) (either term, 3-0-0). The origin, occurrence, and production of oil and gas; the nature of interests in oil and gas; the acquisition and disposition of interests in oil and gas; the rights and duties of parties under oil and gas leases; pooling of oil and gas interests; acquisition of surface leases and pipeline easements.

**LAW 551 Municipal and Planning Law**

★3 (*fi 6*) (either term, 3-0-0). The first part of the course will consist of an examination of the theory, structure, organization and operation of local government units in Alberta. The powers and duties of local governments to make laws, to tax, to expropriate, to enter into contracts and to provide and maintain municipal servicing infrastructure will be explored as will the role of the courts, both procedurally and substantively, in respect of supervising the judicial review proceedings and actions in contract and tort. The second part of the course will focus on municipal duties and powers relative to land use planning and regulation as well as the nature and role of non-municipal planning authorities. The objective is to leave the student with an appreciation of how a subdivision or development project is processed through the maze of regulations and agencies that are typically confronted and the role of the lawyer in that process.

**LAW 552 Natural Resources Law**

★2 (*fi 4*) (either term, 2-0-0). The judicial, legislative, administrative and policy problems related to the regulation and management of natural resources, including problems of allocation, development, use, pollution control, and conservation. Particular emphasis is placed on water resources.

**LAW 555 Labor Law**

★3 (*fi 6*) (either term, 3-0-0). Legal problems concerning the establishment of collective bargaining; negotiation and enforcement of the collective agreement; the activities of unions and employers in industrial disputes; and the internal affairs of labor organizations.

**LAW 556 Labor Arbitration**

★2 (*fi 4*) (either term, 2-0-0). The law and practice relating to interest and rights arbitrations in Alberta. The course will be taught partly as a seminar and partly through a series of mock arbitrations in which students will act as counsel.

**LAW 558 Poverty Law**

★3 (*fi 6*) (either term, 3-0-0). The culture of poverty and its implications for anti-poverty planning will be examined with emphasis on psychological, sociological and economic theory. Organizational models for the delivery of legal services will be considered together with a treatment of the theory of equality, the problem of accessibility to the "claims process" and alternative methods of dispute settlement. The character of the law concerning the poor will be analyzed as reflected in selected case studies in welfare law, public housing policy, workmen's compensation and unemployment insurance.

**LAW 559 Environmental Law and Policy**

★3 (*fi 6*) (either term, 3-0-0). The focus of this course will be the Canadian laws and policies designed to control air, land, and water pollution. The course will introduce basic environmental concepts and examine Canadian regulatory legislation; including licensing systems, the use of quasi-criminal sanctions, and environmental impact assessment processes. The course will also review relevant constitutional issues and evaluate the usefulness of the common law as a means to achieve and maintain environmental quality. Other topics may include alternative legal approaches to the resolution of environmental problems, such as the economic incentives, wildlife protection, an environmental Bill of Rights, wilderness preservation, the public trust doctrine of environmental mediation. Note: Open to second and third year Law students.

**LAW 560 Corporate Taxation**

★3 (*fi 6*) (either term, 3-0-0). The tax consequences of corporation financing; amalgamations, mergers, international business transactions; tax planning from a corporation and personal standpoint; and trends in taxation. Prerequisite: LAW 460.

**LAW 565 International Business Transactions**

★3 (fi 6) (either term, 3-0-0). This is a survey course on the international and domestic law involved in international trade/investment activities of Canadian and foreign business entities. In the international law sphere, the law of the World Trade Organization (WTO) and regional economic integration agreements such as the North American Free Trade Agreement (NAFTA) will be studied. In the area of private law, the legal aspects of international business transactions will be considered, including contract types and drafting, financing of transactions, and dispute settlement by international commercial arbitration.

**LAW 567 Pacific Rim Law**

★2 (fi 4) (either term, 2-0-0). This course will give students the opportunity to understand the Japanese, their society and their law in the context of international society. The exact contents of the course will depend on the speciality area of the visiting professor.

**LAW 570 Civil Procedure**

★4 (fi 8) (variable, 4-0-0). The fundamentals of judicial procedure; the jurisdiction of courts, and the process of the courts. Clinical sessions. Rules of Court.

**LAW 575 Evidence**

★4 (fi 8) (variable, 4-0-0). The adversary system in trial and appellate courts; relevance and admissibility; character evidence including similar facts; opinion evidence; the hearsay rule and its exceptions; illegally obtained evidence; judicial notice; burdens of proof and presumptions; quantum of proof; corroboration; competence, compellability and privilege; parole evidence of rule; oaths and affirmations.

**LAW 580 Trusts**

★3 (fi 6) (either term, 3-0-0). A brief survey of the historical development of the trust. Definition and classification of trusts. Creation of express trust—the three certainties. Completely and incompletely constituted trusts. Secret, protective, discretionary and illusory trusts. Charitable trust and the rule against perpetuities. Cy-pres doctrine. Non-charitable purpose trusts. Implied or resulting trusts. Constructive trusts. Revocation, termination and variation of trusts. The appointment, retirement and removal of trustees. Duties, discretion and powers of trustees. Breach of trust.

**LAW 582 Wills and Administration**

★3 (fi 6) (either term, 3-0-0). Principles of the Wills Act, including formalities of execution, revocation, revival, republication, types of legacies, and principles of construction. Testamentary capacity, fraud, and undue influence. Drafting of wills. Appointment of executors and administrators, their powers and duties; probate practice.

**LAW 585 Women and the Law**

★3 (fi 6) (either term, 3-0-0). This course examines women's relationship to the law in a number of different contexts. Topics covered in the course include: sexual assault, new reproductive technologies, pornography, sexual harassment, the intersection of race and gender, domestic violence, the battered women's syndrome defence, child sexual abuse, fetal protection law, surrogate motherhood, lesbian women and the law, aboriginal women and the law, the feminization of poverty, women in the legal profession, equality litigation and the work of the Women's Legal Education and Action Fund. The course seeks to introduce gender analysis in a legal context. The focus of the course is on debates within feminist legal scholarship about how the law and legal institutions could respond to the concerns of women more effectively.

**LAW 586 Children and the Law**

★3 (fi 6) (either term, 3-0-0). This course will offer a critical examination of the current legislative regime and policy underlying the legal treatment of children in Canadian society. A review of case law and legislation relating to areas such as neglect, guardianship, custody, adoption, young offenders and legal capacity will be undertaken to better understand the policy and law forming a distinct legal regime for children.

**LAW 588 Immigration Law**

★2 (fi 4) (either term, 2-0-0). An in-depth analysis of Immigration Law in Canada. Will review the *Immigration Act and Regulations* and look at various tribunals involved in the immigration process including the Immigration and Refugee Board and the Federal Court. Will provide a brief historical review and discuss new developments in the law and important policy areas.

**LAW 590 Aboriginal Peoples and the Law**

★3 (fi 6) (either term, 3-0-0). This is a survey course on Aboriginal Peoples in Canadian Law. Subjects covered include issues of race and legal reasoning, legal and historical foundations of claims to Aboriginal rights, treaty rights, Metis rights, Aboriginal peoples and the Constitution, Aboriginal claims negotiation and litigation, the *Indian Act*, and contemporary legal and political developments including an introduction to Aboriginal government. The course is organized as a seminar in which a great deal of learning arises from discussion and class participation.

**LAW 595 Research Paper**

★2 (fi 4) (either term, 2-0-0). This program will give selected third year

students an opportunity to engage in original research. The research topic is subject to prior approval of the Associate Dean and the Faculty Supervisor. The research topic shall be different from that used in LAW 495 and have a different Faculty Supervisor.

**LAW 598 Moot Court Competition**

★3 (fi 6) (either term, 3-0-0). Selection to the Gale Cup, Jessup Moot, Laskin Moot, or other designated moot competition team through a preliminary round competition, preparation of a factum or memorial, training in oral advocacy through practice rounds, and participation as a representative of the law school at the moot court competition.

**LAW 599 Seminars on Specialized Legal Topics**

★3 (fi 6) (either term, 0-3s-0). These seminars will cover specialized topics of emerging importance in the law at a senior level. The particular topic covered would vary dependent on the availability of Faculty with necessary teaching competence, student interest, and the needs of the legal profession.

**LAW 600 Conflict of Laws**

★3 (fi 6) (either term, 3-0-0). Theoretical basis of conflict of laws. Preliminary topics: characterization, renvoi, time element domicile. Choice of Law: domestic relations, contract, torts. Jurisdiction and the recognition of foreign judgments.

**LAW 613 Corporate Securities and Finance**

★3 (fi 6) (either term, 3-0-0). The course will cover methods of small business financing including equity, borrowing, government assistance; special structures such as partnerships, joint ventures, farmouts and leases. A second major part of the course will deal with sale of securities to the public, the various parties in public financing, preparation of a prospectus, continuous disclosure and stock exchange requirements; evaluation of and issues involved in takeovers. Prerequisite: LAW 510.

**LAW 614 Credit Transactions II**

★3 (fi 6) (second term, 3-0-0). The course will provide an in-depth analysis of the law of secured transactions in personal property. The salient features of the Alberta Personal Property Security Act will be examined, including topics on scope, attachment, perfection, priority rules, proceeds, and remedies including receivership. The federal Bank Act security will be introduced. The course will also provide an overview of insolvency law. Topics will include fraudulent conveyances and preferences, statutory liens and deemed trusts, bankruptcy and alternatives to bankruptcy. Note: Students are strongly advised to take Credit Transactions I and Credit Transactions II in the same academic year.

**LAW 620 Advanced Criminal Law**

★2 (fi 4) (either term, 2-0-0). The course comprises an examination of substantive criminal law particularly: offences against the person and rights of property; the jury system; juvenile justice and quasi-criminal proceedings; and, the extraordinary remedies.

**LAW 630 Advanced Torts**

★2 (fi 4) (either term, 2-0-0). An analysis of, and problems in, the Law of Torts.

**LAW 635 Advanced Constitutional Law**

★2 (fi 4) (either term, 2-0-0). This course will be conducted on a seminar basis and will examine particular problems in Canadian federalism of contemporary significance.

**LAW 637 Advanced Problems in Constitutional Law**

★3 (fi 6) (either term, 3-0-0). This course entails an examination of various current problems in constitutional law. Topics covered in past years include Criminal Justice and the Charter, Comparative Constitutional Law, and Federal/Provincial Relations.

**LAW 639 Constitutional Litigation**

★3 (fi 6) (either term, 3-0-0). The course will address current issues in constitutional litigation particularly those involving the *Charter*. The emphasis will be on both substantive knowledge of constitutional litigation issues and development of skills within that framework. Issues such as pleadings, interventions and class actions, examination of lay and expert witnesses, the use of extrinsic aids, statistical and other forms of ordinary and expert evidence, forms of remedies, form and role of written briefs, and other related matters will be addressed.

**LAW 640 Real Estate Transactions**

★3 (fi 6) (either term, 3-0-0). The law governing agreements for sale of land; the open contract of sale, implied terms, special covenants in agreements for sale. Remedies of vendors and purchasers; election of remedies; cancellation and determination clauses. Deposits and instalments. Mortgages: legal, equitable and statutory. Foreclosure; sales; redemption; possession and attornment. Prerequisite: LAW 540.

**LAW 650 Alberta Law Review**

★2 (fi 4) (either term, 2-0-0). Students enrolled in this course will be involved in all facets of the production of the *Alberta Law Review*, including the assessment, selection and substantive and stylistic editing of manuscripts submitted for publication. Students enrolled in this course must normally

participate as a member of the Law Review for two academic years to be eligible for credit. Students may be admitted only on application.

#### **LAW 655 Alberta Law Review Research Paper**

★2 (*fi 4*) (either term, 2-0-0). This course will provide members of the Alberta Law Review with an opportunity to engage in original research and to prepare a paper of publishable quality. The research topic is subject to the prior approval of the Faculty Advisor and the Assistant or Associate Dean. The paper must be presented at a seminar of Law Review members.

#### **LAW 659 International Environmental Law**

★3 (*fi 6*) (either term, 3-0-0). This course will examine the development of international law principles in the environmental area. Topics to be covered include: customary principles of state responsibility; transboundary pollution of international waterways; marine pollution control (oil pollution, dumping, and land-based sources); international air pollution control (ozone, climate change, acid rain); transboundary movement of hazardous materials; disarmament and environment; endangered species conservation; and sustainable resource development. The various models for environmental regulation in internationally-shared areas will also be discussed. It is recommended, but not required, that students enrolled in this course take International Law.

#### **LAW 660 Estate Planning**

★2 (*fi 4*) (either term, 2-0-0). A review of the objectives of estate planning; study of various estate planning techniques with the use of hypothetical problems; an examination of provisions found in the Income Tax Act which affect estate planning, estate tax, and gift tax. Prerequisite: LAW 460.

#### **LAW 670 Professional Responsibility**

★2 (*fi 4*) (either term, 0-2s-0). A consideration of the responsibilities of the lawyer to the profession and the profession to the public. Ethics and organization of the profession.

#### **LAW 675 Advanced Evidence**

★2 (*fi 4*) (either term, 2-0-0). This course is designed to offer an in-depth analysis of several areas of current practical value for lawyers. The course will discuss recent developments and future possibilities relating to hearsay evidence, technology and opinion evidence, children as witnesses, and privileges. The course will track developments as to *Charter*-connected matters of the law of evidence, relating to burden of proof, discovery and disclosure, and principles of law touching on exclusion of evidence such as the 'discoverability' rule. The course may also examine special evidentiary rules applicable to special tribunals and boards.

#### **LAW 680 Restitution and Remedies**

★3 (*fi 6*) (either term, 3-0-0). A study of the development and application of the idea of unjust enrichment and the circumstances in which a remedy is available irrespective of an action in tort or contract. This includes quasi-contractual recovery, tracing, and the use of the constructive trust.

#### **LAW 687 Family at Risk**

★3 (*fi 6*) (either term, 3-0-0). This course focuses on the human dimension behind family law. A panorama of subjects will be discussed which may include new family structures, adoption, troubled children, young offenders, and the causes and effects of marriage breakdown.

#### **LAW 695 Research Paper**

★2 (*fi 4*) (either term, 2-0-0). This program will give selected graduate students an opportunity to engage in original research. The research topic is subject to prior approval of the Faculty supervisor and the Chair of the Graduate Studies Committee. The research topic shall be different from the thesis topic.

#### **LAW 699 Seminars on Specialized Legal Topics**

★2 (*fi 4*) (either term, 0-2s-0). Graduate Level. These seminars will cover a specialized topic of emerging importance in the law. The particular topic covered would vary depending on the availability of Faculty with necessary teaching competence, student interest, and the needs of the legal profession.

### 211.137.1 Non-LLB Intersession Courses

**Note:** The following courses, normally offered in Intersession, are available to students in other Faculties. They will not be considered for credit in the LLB program.

#### **LAW 300 Law for Non-LLB Students I**

★3 (*fi 6*) (first term, 30 hours). The nature, functions, and sources of law; an outline and components of the Canadian legal system. Note: Not available for credit in the LLB Program.

#### **LAW 301 Law for Non-LLB Students II**

★3 (*fi 6*) (second term, 30 hours). Topics to be covered will be chosen from among the following: Morality, Obscenity and the Law; Industrial Relations; the Law and the Family; the Law as a Protector; Freedoms allowed under the Legal System; the Law and the Environment. Prerequisite: Normally, LAW 300 would be a prerequisite but this requirement may be waived at the discretion of the instructor. Note: Not available for credit in the LLB program.

#### **LAW 302 Law for Education Students I**

★3 (*fi 6*) (either term, 3-0-0). A thirty-hour course involving introduction to the sources of law, legal history, the legal system and the role of law. A substantive area of law would be studied in depth to illustrate these matters more clearly. Topics covered would include—What is Law, Sources of Law, Origins of Law, the development of the common law and its reception to Canada, The Canadian Legal System, The Relationship of Law and Society. Note: Not available for credit in the LLB Program

### 211.138 Library and Information Studies

School of Library and Information Studies  
Faculty of Education

#### 211.138.1 Undergraduate Courses

##### **LIS 201 Survey of Children's Literature**

★3 (*fi 6*) (either term, 3-0-0). Literature for children from infancy through the elementary school years. The emphasis is on books currently read by children. Principles of evaluation, children's reading needs and interests, and current issues and trends will be examined. This course is not open to MLIS students.

##### **LIS 202 Storytelling**

★3 (*fi 6*) (either term, 3-0-0). The past and present forms of storytelling, including the oral tradition, the function of the storyteller, the selection of material and the techniques of telling stories and listening to stories. This course is not open to MLIS students.

#### 211.138.2 Graduate Courses

**Note:** All the following courses are restricted to MLIS students and may not be offered each year. Interested students should contact the School of Library and Information Studies for scheduling information. The following courses are required for both the thesis and course-based routes of the MLIS program and are normally prerequisites to the rest of the program: LIS 501, 502, 503, 504, 505, and 506.

The following courses are also available as part of the MLIS program: EDES 540, 541, 543, 546, 547, and 548; EDPY 597 and EDAL 547.

##### **LIS 501 Introduction to Library and Information Studies**

★3 (*fi 6*) (first term, 3-0-0). An introduction to the historical, current, and potential roles of library and information professionals in western society. Introduces the study of environmental factors affecting library and information services. Economic, social, legal, political, technological and professional factors will be examined. Required course.

##### **LIS 502 Organization of Knowledge and Information**

★3 (*fi 6*) (first term, 3-0-0). An introduction to the organization of knowledge and information, including bibliographic control, classification, indexing, and abstracting. Required course.

##### **LIS 503 Library Materials and Information Services**

★3 (*fi 6*) (first term, 3-0-0). An introduction to the functions of information services programs, an examination of policies designed to build materials collections in support of such programs, and an opportunity to become familiar with examples of major reference/information sources. Required course.

##### **LIS 504 Management Principles for Library and Information Services**

★3 (*fi 6*) (either term, 3-0-0). An introduction to principles of management applicable to the organization of library and information services. Required course.

##### **LIS 505 Research Methods for Library and Information Studies**

★3 (*fi 6*) (second term, 3-0-0). An introduction to the nature of research and to the methodologies and techniques used in library and information studies. Required course.

##### **LIS 506 Introduction to Automation and Bibliographic Information**

★3 (*fi 6*) (either term, 3-0-0). An introduction to automation and its implications for libraries and information services. Required course.

##### **LIS 511 Materials for Adults**

★3 (*fi 6*) (either term, 3-0-0). The recreational, educational and professional library and information needs of adults (including the less specialized needs of the high school, college and university communities), and the materials available to meet the needs.

##### **LIS 515 Materials for Young Adults**

★3 (*fi 6*) (either term, 3-0-0). Materials for young adults of junior and senior high school age, young adults' reading interests, and current trends and issues in young adults literature.

##### **LIS 517 Government Publications**

★3 (*fi 6*) (either term, 3-0-0). The control and dissemination of government publications, using the Canadian system as a model applicable to other political jurisdictions.

**LIS 519 Introduction to Children's Literature**

★3 (fi 6) (either term, 3-0-0). Literature for children from infancy through the elementary school years, principles of evaluation and selection, and current issues and trends.

**LIS 520 Information Resources in Specialized Fields**

★3 (fi 6) (either term, 3-0-0). Information resources and their administration in a specialized field and for a specialized clientele. The emphasis is on the nature of the field, problems of collection development, bibliographic access, retrieval and use by the clientele, and administrative issues in solving these problems. Specialized fields regularly examined are law, business, and health sciences.

**LIS 525 Reference Service Theory and Field Experience**

★3 (fi 6) (either term, 0-1s-2). A comprehensive examination of the reference interview, measurement and evaluation techniques for reference service, and related administrative concerns. Extensive field experience.

**LIS 531 Collection Management**

★3 (fi 6) (either term, 3-0-0). An analytical approach to collection management including the acquisition, review and evaluation of collections.

**LIS 532 Cataloguing and Classification**

★3 (fi 6) (either term, 3-0-0). The description and classification of various forms of materials for either manual or computerized situations.

**LIS 535 Indexing and Abstracting**

★3 (fi 6) (either term, 3-0-0). The principles and practice of indexing and abstracting in a traditional or computerized centre.

**LIS 536 Online Searching**

★3 (fi 6) (either term, 3-0-0). Online information storage and retrieval services, including their development, maintenance, and use. This course requires the payment of additional miscellaneous fees. See §22.2.3 for details.

**LIS 537 Management of Information Technology**

★3 (fi 6) (either term, 3-0-0). Areas of library and information operations suitable for computer applications with emphasis on management and evaluation.

**LIS 538 Automation in Libraries and Information Centres**

★3 (fi 6) (either term, 3-0-0). An examination of topics of current interest related to the application of computers and communications technology in libraries and information centres.

**LIS 540 School Media Centres**

★3 (fi 6) (either term, 3-0-0). The concept and organization of media resource centres in elementary and secondary schools.

**LIS 545 Management of Resources in Library and Information Services**

★3 (fi 6) (either term, 3-0-0). The field of resource management and its application in library and information services.

**LIS 546 Marketing Library and Information Services**

★3 (fi 6) (either term, 3-0-0). The principles of marketing and public relations for nonprofit organizations, with an emphasis on library and information services.

**LIS 548 Library Services to Children and Young Adults**

★3 (fi 6) (either term, 3-0-0). The principles and practices of library service to children and young adults. Prerequisite: LIS 515 or 519.

**LIS 582 Contemporary Issues in Library and Information Studies**

★3 (fi 6) (either term, 0-3s-0). New and continuing topics of concern or debate in the library and information professions, and how they influence information attitudes and programs.

**LIS 583 Comparative Librarianship**

★3 (fi 6) (either term, 0-3s-0). The nature of comparative librarianship as a discipline, and the application of principles to practice.

**LIS 584 Library and Information Systems and Networks**

★3 (fi 6) (first term, 3-0-0). Library cooperation, and the management of systems and networks.

**LIS 586 History of the Book**

★3 (fi 6) (either term, 3-0-0). The historical, aesthetic, and economic bases of the 'book' and its role in the recording and preservation of information and ideas.

**LIS 587 Library Buildings**

★3 (fi 6) (either term, 3-0-0). Various types of library building needs, the involvement of librarians and architects in the planning process, and various contemporary building styles.

**LIS 588 Communications**

★3 (fi 6) (second term, 3-0-0). The principles and practices of professional communication in library and information service organizations.

**LIS 590 Practicum**

★3 (fi 6) (either term, 100 hours). The application of course work learning through experiential learning in a library and information centre setting. Prerequisite: completion of 8 courses in the MLIS program.

**LIS 591 Publishing**

★3 (fi 6) (either term, 3-0-0). The organized business of writing, manufacturing and marketing of books and other media.

**LIS 593 Archives Administration**

★3 (fi 6) (either term, 3-0-0). Archival records and their role in the preservation of information resources.

**LIS 594 Records Management**

★3 (fi 6) (either term, 3-0-0). The theory and techniques of records management.

**LIS 597 Seminar in Advanced Research Methods for Library and Information Studies**

★3 (fi 6) (first term, 0-3s-0). In-depth examination of research methodologies relevant to the field of library and information studies, and to the research interests of students pursuing doctoral programs, thesis-route master's programs, and other advanced projects.

**LIS 598 Special Topics**

★3 (fi 6) (either term, 3-0-0). A current topic of significance to, or a special aspect of, library and information studies may be examined as demand and resources permit.

**LIS 599 Directed Study**

★3 (fi 6) (either term, 0-3s-0). Further study of special topics and issues, based on knowledge acquired in previous courses or on significant prior experience. Topic to be approved by the School.

**LIS 600 Capping Exercise**

★0 (fi 1) (either term, 12 hours). The required capping exercise will be a substantial revision of the major paper written for LIS 501. The capping exercise paper is to be submitted during the final term of course work.

**211.139 Linguistics**

Department of Linguistics  
Faculty of Arts

**211.139.1 Undergraduate Courses****§ LING 101 Introduction to Linguistics I**

★3 (fi 6) (either term, 3-0-0). An introduction to the central concepts of linguistics: linguistic categories and structure (phonetics, phonology, morphology, syntax, semantics). Formerly LING 201.

**§ LING 102 Introduction to Linguistics II**

★3 (fi 6) (either term, 3-0-0). An introduction to historical, cross-disciplinary, and applied areas in linguistics (e.g. language change, language acquisition, language in society). Prerequisite: LING 101. Formerly LING 202.

**§ LING 204 English Syntax**

★3 (fi 6) (either term, 3-0-0). Linguistic analysis of the syntax of modern English. Prerequisite: LING 101. Formerly LING 382.

**§ LING 205 Practical Phonetics**

★3 (fi 6) (either term, 3-0-0). Recognizing, transcribing, and producing speech sounds using the International Phonetic Alphabet; problems in phonetic analysis; techniques for describing the sound system of an unfamiliar language.

**§ LING 208 Morphology and the Lexicon**

★3 (fi 6) (either term, 3-0-0). Basic principles of word formation and structure; the organization of the lexicon and the representation of words. Prerequisite: LING 101.

**§ LING 209 Syntax and Semantics**

★3 (fi 6) (either term, 3-0-0). Basic principles in syntax (constituent structure, sentence relatedness, grammatical relations) and semantics. Prerequisite: LING 101. Note: Not to be taken by students with credit in LING 204 before 1992-93.

**§ LING 210 Phonetics and Phonology**

★3 (fi 6) (either term, 3-0-0). Basic principles of descriptive phonetics and of phonology. Prerequisite: LING 101. Note: Not to be taken by students with credit in LING 203.

**§ LING 312 Experimental Phonetics and Speech Science**

★3 (fi 6) (either term, 3-0-0). Articulatory phonetics; anatomy of speech and hearing; interpretation of sound spectrograms; models of speech production and perception. Prerequisite: LING 101 or 205 or consent of Department.

**§ LING 314 Discourse Analysis**

★3 (fi 6) (either term, 3-0-0). Analysis of selected approaches to the study of discourse including conversational analysis, narrative structure, text analysis. Prerequisite: LING 101.

**§ LING 316 Sociolinguistics**

★3 (fi 6) (either term, 3-0-0). An examination of phonological, syntactic,

lexical, and semantic variation in language systems in connection with extralinguistic factors such as individual, social, or demographic differences. Prerequisite: LING 101. Formerly LING 411.

**S LING 318 Development of Modern Linguistic Concepts**

★3 (fi 6) (either term, 3-0-0). An examination of the fundamental concepts of 20th-century linguistic thought: de Saussure, Sapir, Bloomfield, Firth, the Prague School, and others. Prerequisite: LING 101, or consent of Department. Formerly LING 408.

**S LING 319 Child Language Acquisition**

★3 (fi 6) (either term, 3-0-0). Basic issues in first language acquisition; theories, research methods, and major findings. Prerequisite: LING 101. Formerly LING 416.

**S LING 320 Second Language Acquisition**

★3 (fi 6) (either term, 3-0-0). Application of linguistics to theoretical issues in second-language acquisition: properties of language, problems of languages in contact, psycholinguistic aspects of bilingualism. Prerequisite: LING 101. Formerly LING 450.

**S LING 321 Neurolinguistics**

★3 (fi 6) (either term, 3-0-0). A neurolinguistic approach to the representation and processing of linguistic structures in the brain; patterns of language breakdown resulting from damage to the brain. Prerequisite: LING 101 or consent of Department.

**S LING 322 Language and Gender**

★3 (fi 6) (either term, 3-0-0). An examination of gender-related differences in the structure of language, discourse, communication, and how those differences relate to language processing, acquisition, and loss. Prerequisite: LING 101 or consent of Department. Not offered every year.

**S LING 323 Linguistics and the Mind**

★3 (fi 6) (either term, 3-0-0). Language as an expression of the symbolic capacity of the mind. Attention will be given to the relation between linguistic meaning and such concepts as belief, judgement, and assertion, and between these and our knowledge of the world. Prerequisite: None.

**S LING 332 The Nature of Foreign Accent**

★3 (fi 6) (either term, 3-0-0). A study of the causes of foreign accent and a critical examination of the various strategies used in foreign accent reduction. Prerequisite: LING 210 or consent of Department.

**LING 399 Special Topics in Linguistics**

★3 (fi 6) (either term, 3-0-0). A study of recent developments in particular sub-areas of linguistics. Prerequisite: consent of Department.

**S LING 401 Semantics**

★3 (fi 6) (either term, 3-0-0). An overview of natural language semantics at both the lexical and clause levels. Topics covered include sense, reference, features, compositionality, semantic roles, logical form, categorization, and conceptualization. Prerequisite: LING 208 and 209.

**S LING 405 Historical Linguistics**

★3 (fi 6) (either term, 3-0-0). Principles and methods in the study of language change. Prerequisites: LING 208 and 210.

**S LING 407 Linguistic Typology**

★3 (fi 6) (either term, 3-0-0). A survey of similarities, differences, tendencies, and universals in the phonological, morphological, and syntactic patterns of different languages. Prerequisites: LING 208 and 209.

**S LING 409 Syntactic Theory**

★3 (fi 6) (either term, 3-0-0). Syntactic analysis and argumentation in generative theory and its extensions and revisions. Prerequisite: LING 209; 208 or 210.

**S LING 410 Phonological Theory**

★3 (fi 6) (either term, 3-0-0). Generative phonological analysis: phonological rules, representations, and related theoretical issues. Prerequisite: LING 210; 208 or 209.

**LING 499 Special Topics in Linguistic Theory**

★3 (fi 6) (either term, 3-0-0). A course designed to explore recent developments in particular areas of linguistic theory. Prerequisite: consent of Department.

**S LING 500 Psycholinguistics**

★3 (fi 6) (either term, 3-0-0). Issues and methods involved in the experimental study of language: language production, comprehension, the mental lexicon, and discourse. Prerequisite: LING 209; 208 or 210, STAT 141 or PSYCO 211 recommended.

**S LING 501 Research Project Seminar**

★3 (fi 6) (first term, 3-0-0). Requires a literature review, devising research methodology, writing and defending a project proposal. Prerequisite: consent of Department.

**LING 502 Honors Project**

★3 (fi 6) (second term, 3-0-0). Directed Honors thesis. Prerequisites: LING 501 and consent of Department. Note: Required of all BA (Honors) students in Linguistics in their final year.

**S LING 509 Recent Developments in Syntactic Theory**

★3 (fi 6) (either term, 3-1s-0). Advanced syntactic analysis and related theoretical issues. Prerequisite: consent of Department.

**S LING 510 Recent Developments in Phonological Theory**

★3 (fi 6) (either term, 3-1s-0). Advanced phonological analysis and related theoretical issues. Prerequisite: consent of Department.

**S LING 512 Acoustic Phonetics**

★3 (fi 6) (either term, 3-0-0). Analysis of the articulatory, perceptual, and acoustic aspects of the speech signal; measuring the acoustic aspects of speech. Prerequisite: LING 312 (LING 412, prior to 1997/98).

**LING 599 Special Topics in Linguistic Research**

★3 (fi 6) (either term, 3-0-0). A study of recent developments in particular areas of linguistic research. Prerequisite: consent of Department. Formerly LING 443.

## 211.139.2 Graduate Courses

**S LING 601 Seminar in Phonology and Morphology**

★3 (fi 6) (either term, 0-3s-0). Critical examination of selected theoretical issues and related experimental studies in phonology and morphology. Prerequisite: LING 510 or consent of Department.

**S LING 602 Seminar in Syntax**

★3 (fi 6) (either term, 0-3s-0). Critical examination of selected theoretical issues and related experimental studies in syntax. Prerequisite: LING 509 or consent of Department.

**S LING 603 Quantitative Methods in Linguistics**

★3 (fi 6) (either term, 3-0-0). Analysis of variance and experimental design in relation to problems in experimental linguistics. Prerequisite: A course in elementary statistics or consent of Department.

**S LING 604 Seminar in Psycholinguistics**

★3 (fi 6) (either term, 3-0-0). A review of the current theories and research in psycholinguistics. Prerequisite: LING 500.

**S LING 605 Seminar in Experimental Phonetics**

★3 (fi 6) (either term, 3-0-0). A survey of the present state of knowledge in speech production and perception. Prerequisite: LING 512 (LING 412 prior to 1997/98).

**S LING 610 Formal Grammatical Theory**

★3 (fi 6) (either term, 3-0-0). Current approaches in formal grammatical theory. Prerequisite: LING 602 or consent of Department.

**S LING 611 Formal Phonological Theory**

★3 (fi 6) (either term, 3-0-0). Current approaches in formal phonological theory. Prerequisite: LING 601 or consent of Department.

**S LING 614 Methods in Experimental Phonetics**

★3 (fi 6) (either term, 0-1s-3). Theoretical and practical training in experimental phonetics. Emphasis on practical experience with on-going research. Prerequisite: LING 512 (LING 412 prior to 1997/98).

**S LING 615 Methods in Experimental Psycholinguistics**

★3 (fi 6) (either term, 0-1s-3). Theoretical and practical training in experimental psycholinguistics. (Emphasis on practical experience with on-going research.) Note: This course should be taken late in the MSc program. Prerequisite: LING 603.

**S LING 616 Methods in Experimental Phonology**

★3 (fi 6) (either term, 0-1s-3). Theoretical and practical training in experimental phonology. Emphasis on practical experience with on-going research. Prerequisite: LING 603.

**S LING 617 Methods in Second Language Acquisition**

★3 (fi 6) (either term, 0-1s-3). Theoretical and practical training in second language acquisition research, with emphasis on practical experience. Prerequisite: LING 603.

**S LING 631 Sentence Processing**

★3 (fi 6) (either term, 3-0-0). Analysis of recent theoretical and empirical research in sentence comprehension and production. Prerequisite: LING 500 or consent of Department.

**S LING 636 Analysis of Meaning**

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

**S LING 637 Discourse Analysis**

★3 (fi 6) (either term, 0-3s-0). An examination of a variety of topics in the area of discourse including discourse structure, pragmatics, discourse-conditioned grammatical alterations, and discourse models. Prerequisite: consent of Department.

**S LING 638 Second Language Acquisition**

★3 (fi 6) (either term, 3-0-0). Analysis of recent theoretical and empirical research in second language acquisition. Prerequisite: LING 320 or consent of Department.

**S LING 645 Linguistic Analysis of Aphasic Language**

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

**S LING 655 Instrumentation in Experimental Linguistics**

★3 (fi 6) (either term, 3-0-0). Prerequisites: LING 312 and 512, MATH 117 and 118 or consent of Department.

**S LING 670 Foreign Language Analysis**

★3 (fi 6) (either term, 0-1s-3). Study and analysis of a language other than English resulting in demonstrated proficiency as well as analytic competency of the language's structural, psycholinguistic, or acquisitional properties. Prerequisite: consent of Department.

**S LING 683 Conference Course I**

★3 (fi 6) (first term, 0-3s-0).

**S LING 684 Conference Course II**

★3 (fi 6) (second term, 0-3s-0).

**S LING 900 Directed Research Project**

★3 (fi 6) (variable).

211.140 Reserved

**211.141 Linguistique**

Faculté Saint-Jean

**LINGQ 200 Introduction à l'étude du langage**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude du langage comme phénomène social et individuel. La langue et son fonctionnement. Anciennement LINGQ 101.

**LINGQ 300 Linguistique appliquée**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Application de la linguistique à l'enseignement, à la traduction, à l'ingénierie et à la littérature. Prérequis: LINGQ 200 ou équivalent. Anciennement LINGQ 430.

**LINGQ 499 Etude dirigée en linguistique**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Prérequis: l'accord du Vice-doyen aux affaires académiques.

**211.142 Linguistique romane**

Faculté Saint-Jean

**LIN R 320 Linguistique française: phonétique et morphophonologie**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Phonétique et phonologie comparées du français standard, du canadien-français et de l'anglais. Morphèmes de l'oral et de l'écrit. Evolution phonétique: incidence sur le français actuel. Facteur auditif et acquisition de L2. Prérequis: LINGQ 200. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour R LIN 401 à la Faculté des Arts. Anciennement LIN R 420.

**221.143 Maîtrise en sciences de l'éducation**

Faculté Saint-Jean

**M EDU 500 Langue, culture et éducation**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude interdisciplinaire (anthropologie, sociologie, psychologie sociale) des théories scientifiques contemporaines sur la nature de la culture, ses rapports avec la langue et ses mécanismes de transmission et de modification. La problématique locale sera examinée dans le contexte de la communauté scientifique internationale. L'histoire de la science de l'éducation bilingue sera aussi abordée.

**M EDU 501 La culture et l'individu**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude de la relation entre culture et personnalité dans les sociétés homogènes selon les théories de l'anthropologie psychologique. L'application de ces principes aux sociétés industrialisées permettra de mieux comprendre le développement de l'identité culturelle chez l'être humain et ses rapports avec l'identité de soi dans/parmi les groupes ethno-culturels en situation minoritaire.

**M EDU 510 Psychologie de l'apprentissage d'une deuxième langue**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Analyse des divers facteurs qui influencent l'apprentissage d'une deuxième langue. Etude des différentes dimensions du bilinguisme (aspects psychologique, cognitif, socio-linguistique, et socio-culturel).

**M EDU 511 Fondements théoriques de l'acquisition de la langue**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des diverses théories de l'acquisition de la langue. Le rôle de la langue dans le développement de l'enfant. Le lien entre le développement langagier et le développement cognitif.

**M EDU 520 Tendances actuelles en éducation des francophones**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des phénomènes propres à l'éducation des Francophones au Canada selon la pratique et la recherche effectuées dans les diverses provinces: abandon du bilinguisme institutionnel; programmes socio-culturels; innovations en didactique de la langue maternelle.

**M EDU 521 Tendances actuelles en pédagogie de l'immersion française**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude critique des orientations théoriques et des pratiques actuelles dans la pédagogie de l'immersion française. Analyse de questions importantes dans l'implantation des programmes d'immersion.

**M EDU 530 La problématique de l'enseignement des langues**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude de la langue et de son impact sur le développement de la personne. Nouvelles orientations centrées sur les réalités de l'enseignement des langues telles que l'intégration des matières, l'individualisation, l'enseignement par atelier, etc.

**M EDU 531 La problématique de la technologie et de la science face au curriculum**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des récents développements technologiques, scientifiques et sociaux qui ont un impact significatif sur le curriculum.

**M EDU 532 L'écologie de la salle de classe**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des influences et des relations interpersonnelles qui ont un effet sur l'apprentissage, l'enseignement et la communication en salle de classe.

**M EDU 533 L'évaluation en milieu scolaire**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des différents types d'évaluation utilisés dans le milieu scolaire selon les objectifs poursuivis et les innovations récentes en évaluation.

**M EDU 540 Dimensions politiques et administratives de l'éducation bilingue**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des structures de l'éducation française et bilingue dans les diverses provinces canadiennes et du rapport existant entre ces structures et le contexte socio-politique.

**M EDU 580 Méthodologie de la recherche en éducation I**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude du processus de la recherche et des concepts de base de la recherche en éducation. Présentation des divers types de recherches: méthodes de collecte de données et les instruments, analyse et interprétation.

**M EDU 581 Méthodologie de la recherche en éducation II**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Pendant ce cours, chaque étudiant doit approfondir son projet de recherche. Après un survol des devis expérimentaux (ou d'échantillonnage selon le cas), de la statistique descriptive et inférentielle, et de la probabilité, chacun fera une analyse multi-causale du problème (visant à intégrer ses recherches qualitatives et quantitatives), développera son hypothèse et des méthodes de collecte convenables, et choisira les tests statistiques appropriés: moyennes, méta-analyse avec écarts-types, régressions ou corrélations multiples, Chi carré, tests non-paramétriques, ANOVA, ANCOVA, MANOVA et d'autres analyses multivariées. Sera enseigné surtout: le choix des tests appropriés; l'utilisation des ordinateurs dans le traitement, la synthèse et la présentation graphique des données; comment éviter les erreurs d'interprétation et de prédiction. Prérequis: M EDU 580.

**M EDU 582 Séminaire de recherche**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Rédaction d'un exposé écrit dans lequel l'étudiant doit tenter de préciser le problème qui est à la source de sa recherche et les objectifs de celle-ci, de situer le sujet étudié dans un cadre de référence général, de formuler la problématique de la recherche. Présentation par l'étudiant d'un exposé écrit.

**M EDU 583 La recherche et le praticien**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Etude des retombées de la recherche sur la pratique éducative. Méthodologie de la recherche-action, et la formation professionnelle continue des enseignants.

**M EDU 594 Lectures dirigées**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0).

**M EDU 596 Thème ouvert**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0).

**M EDU 597 Séminaire portant sur l'enseignement au niveau élémentaire**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0).

**M EDU 598 Séminaire portant sur l'enseignement au niveau secondaire**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0).

**M EDU 599 Etude personnelle dirigée**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0).

**M EDU 900 Projet de recherche dirigé**

★6 (fi 12) (variable).

## 211.144 Management Information Systems

Department of Accounting and  
Management Information Systems  
Faculty of Business

**Note:** Enrolment in all MIS 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.

### 211.144.1 Undergraduate Courses

#### MIS 311 Management Information Systems

★3 (fi 6) (either term, 3-0-0). Introduction to all major areas of information systems. Technology and file systems, organizational and behavioral issues, data modeling, databases, expert systems, systems analysis, systems development life cycle, etc. Development of analytical skills which can be brought to bear on MIS problems. Note: Students are expected to have basic familiarity with microcomputer applications.

#### MIS 412 Managerial Support Systems

★3 (fi 6) (either term, 3-0-0). Use of information technology to support the efficiency and effectiveness of management decision-making. Fundamentals of four information technologies: (1) decision support systems, (2) group decision support systems, (3) executive information systems, and (4) knowledge-based expert systems. Construction and use of technologies by managers. Use of integrative cases to analyze introduction of technology and how it transforms managerial work. Prerequisite: MIS 311.

#### MIS 413 Systems Analysis and Design

★3 (fi 6) (either term, 3-0-0). Critical stages of the traditional systems development life cycle. Determination and analysis of information systems requirements and their translation into detailed design specifications. Technical and managerial aspects of systems analysis, design and implementation. Design, evaluation, and selection of the five components of computerised information systems: data, hardware, software, people, and procedures. Prerequisite: MIS 311.

#### MIS 414 Information Systems Management

★3 (fi 6) (either term, 3-0-0). Problems of administering and managing computer based information systems. Managerial techniques for prevention and resolution of such problems. Management issues in developing an effective interface between the information systems function and user groups in an organization. Prerequisite: MIS 311.

#### MIS 415 Data Base Design and Administration

★3 (fi 6) (either term, 3-0-0). Application of database concepts in organizations. Introduction to the basic concepts of the database approach and the theoretical models that underlie the field. Design and implementation of databases using each of the three major data models: hierarchical, network, and relational. Handling of security, integrity, and privacy issues. Topics of special current interest such as distributed database systems and database machines. Prerequisite: MIS 311.

#### MIS 494 Individual Research Projects

★3 (fi 6) (either term, 3-0-0). Special study for advanced undergraduates. Prerequisites: consent of Instructor and Associate Dean. (When a student registers in this course for a second or third term subsequent higher course numbers are to be used: MIS 495, 496.)

### 211.144.2 Graduate Courses

#### MIS 541 Introduction to Management Information Systems

★1.5 (fi 3) (either term, 18 hours). This course is designed to equip students with a basic knowledge and understanding of the management of information systems in modern organizations and to prepare them to function as knowledge workers in the information age. The course has three modules—the strategic importance of information technology, the development and implementation of an information technology plan and the basic components of the information technology infrastructure. Each module concludes with a case discussing the main points with which managers must be concerned. Offered in a six-week period.

#### MIS 611 Seminar in Information Systems

★3 (fi 6) (either term, 3-0-0). The seminar will consider a wide range of topics concerned with information systems. These will include technology and file systems, data modelling, databases, expert systems, systems analysis and systems development life cycle, as well as the organizational and behavioral issues connected with the structure and efficiency of organizations. The seminar will also help students to develop analytical skills which can be brought to bear on MIS problems. Prerequisites: MGTSC 502 and MGTSC 514.

#### MIS 612 Developing Management Information Systems

★3 (fi 6) (either term, 3-0-0). This course will explore how information

technology can be used to support the efficiency and effectiveness of management decision-making. It will discuss the fundamentals of four information technologies that have a direct impact on management: (1) decision support systems, (2) group decision support systems, (3) executive information systems, and (4) knowledge-based expert systems. While the focus will be on how these technologies are constructed and used by managers, integrative cases will be used to analyze issues such as how new managerial technology should be introduced into organizations and how managerial work is being transformed by modern information technology.

#### MIS 613 Systems Analysis and Design

★3 (fi 6) (either term, 3-0-0). An examination of the critical stages of the traditional systems development life cycle. Determination and analysis of management information system requirements and translation into detailed design specifications including technical and managerial aspects of systems analysis, design, and implementation; general structure of organizational information systems and major characteristics of common management information system applications. Concepts of life cycle, analysis and design tools and techniques are also presented. Behavioral aspects of management information system implementation are considered. Prerequisite: MIS 611.

#### MIS 614 Information Systems Management

★3 (fi 6) (either term, 3-0-0). The course considers problems of administering and managing computer-based information systems, and managerial techniques for prevention and resolution of such problems, using case studies and guest lectures. Cases are large in scope and integrative rather than focusing on one discipline. Management issues in developing an effective interface between the information systems function and user groups in an organization are also discussed. Prerequisite: MIS 611.

#### MIS 686 Selected Topics in Management Information Systems

★3 (fi 6) (either term, 3-0-0). Topics dealt with in this seminar may vary from year to year and will be chosen at the discretion of the instructor.

#### MIS 704 Individual Research

★3 (fi 6) (either term, 3-0-0).

## 211.145 Management Science

Department of Finance and Management Science  
Faculty of Business

**Note:** Enrolment in all MGTSC 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.

### 211.145.1 Undergraduate Courses

#### MGTSC 301 Probability and Statistics for Business, Part I

★3 (fi 6) (either term, 3-0-0). This course introduces managerial applications of probability, random variables, expectations and variance, normal and other distributions, analysis display, and presentation of information. Spreadsheets will be an important tool throughout the course and extensive computer use will be required. Therefore students should already possess basic familiarity with microcomputer applications. This course begins with an overview of spreadsheets. Prerequisite: MATH 113 or 114.

#### MGTSC 312 Probability and Statistics for Business, Part II

★3 (fi 6) (either term, 3-0-0). This course deals with model building, multiple regression analysis, and related methods useful in a business environment. Microcomputer software will be utilized throughout the course, with necessary computing skills being taught as the course proceeds. However, students are expected to already possess some basic familiarity with microcomputer applications. Prerequisite: MGTSC 301 or STAT 151.

#### MGTSC 352 Operations Management

★3 (fi 6) (either term, 3-0-1). A problem-solving course which introduces the student to deterministic and stochastic models which are useful for production planning and operations management in business and government. Note: Students are expected to have basic familiarity with microcomputer applications. Prerequisite: MATH 120.

#### MGTSC 404 Decision Analysis

★3 (fi 6) (either term, 3-0-0). This course helps students deal systematically with decisions involving two or more parties with opposing interests. Decision trees and influence diagrams are used to model available strategies and weigh tradeoffs. Game-theoretic models for bidding, bargaining, and negotiation are examined and applied in case studies and simulations. Particular attention is paid to the effect of uncertainty and the strategic use of private information. Possible examples include labor negotiations, baseball salary arbitration, construction bidding, international boundary disputes, and environmental hazard location. Ethical and moral issues are discussed. Prerequisite: MGTSC 312.

**MGTSC 405 Forecasting for Planners and Managers**

★3 (*fi 6*) (either term, 3-0-0). Every decision rests upon a forecast. This course examines statistical procedures for forecasting time series, matching the forecasting method to the setting, and assessment of forecast accuracy. Topics covered include forecasting single and multiple time series, the optimal combination of forecasts, adjusting for unmeasured events, and how to compensate for low quality data series. The emphasis is on the manager as forecaster. The objective of the course is to provide the individual with the skills necessary to produce the best possible forecasts from the sources at hand. The analysis and forecasting of series from finance, economics, marketing, accounting, and other areas relevant to business will be required. Prerequisite: MGTSC 312.

**MGTSC 422 Simulation and Computer Modelling Techniques in Management**

★3 (*fi 6*) (either term, 3-0-0). This course will discuss computer modelling of management systems in such functional areas as accounting, finance, marketing and production; basic concepts of deterministic and probabilistic (Monte Carlo) simulation; implementation using various computer languages; case studies. Microcomputer applications will be particularly emphasized. Prerequisites: One course in Accounting (FIN 301 is recommended).

**MGTSC 426 Service Operations Management**

★3 (*fi 6*) (either term, 3-0-0). This course introduces tools that managers can use to increase profits from operating decisions in service businesses and other service organizations. These decisions range from strategic (where to locate, what to sell) to tactical (how to schedule employees for the coming week). The course will emphasize realistic business projects and the use of easily available software tools. Examples of topics are models to describe and reduce congestion, work force scheduling heuristics, and selected marketing models. Prerequisite: MGTSC 352 or instructor's permission.

**MGTSC 428 Environmental Operations Management**

★3 (*fi 6*) (either term, 3-0-0). Decision-support models for managerial decisions with environmental impact. Examination of issues such as energy planning, water resource choices, and hazardous waste logistics with management science tools. Multicriteria decision-making will be introduced and applied. Prerequisites: MGTSC 352.

**MGTSC 455 Quality Management**

★3 (*fi 6*) (either term, 3-0-0). The objective of the course is to study and understand process and product variation, interactions among product and process variables, and ultimately to take action to reduce variation. The topics covered include statistical process control, design of experiment, factorial design, Taguchi's methods and cases, and applications of quality control in management. Prerequisite: MGTSC 312.

**MGTSC 461 Distribution Management**

★3 (*fi 6*) (either term, 3-0-0). This course will deal with the economically efficient distribution of goods and services from their points of creation to the customers. Topics will include strategic decisions, such as aggregate distribution plans and warehouse location, as well as operational decisions, such as selection of delivery routes and dispatching. This course has a significant microcomputer component. The potential of geographic-information-systems as a profit tool will be demonstrated. Prerequisite: MGTSC 352 or Instructor's permission.

**MGTSC 463 Problem Solving**

★3 (*fi 6*) (either term, 3-0-0). The focus of this course is on solving difficult business problems using relatively simple computational techniques. The problems will come from different functional areas of business with an emphasis on operations. The common characteristics of these problems are a large number of possible solutions, difficulty in selecting the best solution, and a level of complexity that does not allow for simple analytic solutions. The course's "quick-and-dirty" (heuristic) solution techniques will be implemented on microcomputers. Prerequisite: MGTSC 352 or Instructor's permission.

**MGTSC 465 Management of New Technology**

★3 (*fi 6*) (either term, 3-0-0). In many firms, new technology has the potential to increase competitive advantage. This course looks at the development of products and services which embody new scientific and technical information, and the incorporation of up-to-date technical information in manufacturing and distribution systems. The main thrust of the course will be decisions on the profitable development and adoption of new technology, but there will also be some consideration of policies for government-business cooperation in stimulating and using new inventions and discoveries. The course will include a mix of cases and lectures designed to focus on the significant ways in which new of technology can increase profit potential. Prerequisite: MGTSC 352 or Instructor's permission.

**MGTSC 488 Selected Topics in Management Science**

★3 (*fi 6*) (either term, 3-0-0). Prerequisite: consent of Department Chair.

**MGTSC 495 Individual Research Projects**

★3 (*fi 6*) (either term, 3-0-0). Special study for advanced undergraduates. Prerequisites: consent of Instructor and Associate Dean. (When a student

registers in this course for a second or third time, subsequent higher course numbers are to be used: MGTSC 496, 497.)

**211.145.2 Graduate Courses****MGTSC 501 Decision Analysis**

★1.5 (*fi 3*) (either term, 18 hours). This course provides an overview of probability concepts. A survey of decision theory and computer simulation is also included. The student is introduced to concepts using a variety of cases and assignments. Formulation of problems and interpretation of results are stressed. Computer spreadsheet software is used throughout. Offered in a six-week period.

**MGTSC 511 Data Analysis**

★1.5 (*fi 3*) (either term, 18 hours). This course begins with a survey of graphical and numerical techniques available for studying and describing data. A statistics computer software package is used. Following an introduction to probability distributions, an overview of statistical inference for means and proportions is provided. The emphasis will be on the application of these techniques to managerial decision making. Offered in a six-week period. Corequisite: MGTSC 501.

**MGTSC 521 Statistical Models**

★1.5 (*fi 3*) (either term, 18 hours). This course is concerned with statistical inference techniques for various models. Regression, analysis of variance, and time series models are discussed. Statistical computer software is used to apply the techniques to business data sets. The data analyzed throughout the course will be representative of data commonly employed by managers. Offered in a six-week period. Corequisite: MGTSC 511.

**MGTSC 541 Production and Operations Management**

★1.5 (*fi 3*) (either term, 18 hours). This course focuses on the creation and delivery of goods and services. The emphasis is on the analytical solution methods for strategic and tactical decisions. Specific modules may include forecasting, project management, facility location, aggregate planning, scheduling, inventory management, distribution and transportation. A number of cases will be introduced and models of realistic problems will be implemented on microcomputers.

**MGTSC 604 Bargaining and Negotiation**

★3 (*fi 6*) (either term, 3-0-0). This course is a blend of both experiential learning and theory with the objective of making the student more effective in all types of bargaining. A study of positive theories on how to improve negotiation skills will be combined with analytical models of the game theoretic structure of bargaining. Through this mix of theories and several case studies and bargaining exercises, students will see both the opportunities for joint gain ("win-win") and the constraints which can lead to inferior outcomes. Prerequisite: MGTSC 501 and MANEC 501.

**MGTSC 614 Applied Time Series Analysis**

★3 (*fi 6*) (either term, 3-0-0). This course is designed to develop an understanding of statistical modelling techniques used in forecasting business time series. The emphasis is on ARIMA modelling of univariate and multiple time series. Computer programs are used to apply the models to series from a wide range of business areas. Additional topics may include intervention analysis, forecast evaluation, causality analysis, combining forecasts, and nonlinear models. Prerequisite: MGTSC 514 or equivalent.

**MGTSC 626 Service Operations Management**

★3 (*fi 6*) (either term, 3-0-0). This course introduces tools that managers can use to increase profits from operating decisions in service businesses and other service organizations. These decisions range from strategic (where to locate, what to sell) to tactical (how to schedule employees for the coming week). The course will emphasize realistic business projects and the use of easily available software tools. Examples of topics are models to describe and reduce congestion, workforce scheduling heuristics, and selected marketing models. Prerequisite: MGTSC 501, 511, 521 or Instructor's permission.

**MGTSC 632 Simulation and Computer Modelling Techniques in Management**

★3 (*fi 6*) (either term, 3-0-0). This course will discuss computer modelling of management systems in such functional areas as accounting, finance, marketing, and production. Basic concepts of deterministic and probabilistic (Monte Carlo) simulation and their applications will also be covered. Micro computer implementations of case studies using spreadsheets will be particularly emphasized. A term project will be required. Prerequisite: MGTSC 514 or equivalent.

**MGTSC 655 Quality Management**

★3 (*fi 6*) (either term, 3-0-0). The objective of the course is to study and understand process and product variation, interactions among product and process variables and ultimately to take action to reduce variation. The topics covered include statistical process control, design of experiment, factorial design, Taguchi's methods and cases and applications of quality control in management.

**MGTSC 661 Distribution Management**

★3 (fi 6) (either term, 3-0-0). This course will deal with the economically efficient distribution of goods and services from their points of creation to the customers. Topics will include strategic decisions, such as aggregate distribution plans and warehouse location, as well as operational decisions, such as selection of delivery routes and dispatching. This course has a significant microcomputer component. The potential of geographic-information-systems as a profit tool will be demonstrated. Prerequisite: MGTSC 501, 511, 521 or Instructor's permission.

**MGTSC 663 Problem Solving**

★3 (fi 6) (either term, 3-0-0). The focus of this course is on solving difficult business problems using relatively simple computational techniques. The problems will come from different functional areas of business with an emphasis on operations. The common characteristics of these problems are a large number of possible solutions, difficulty in selecting the best solution, and a level of complexity that does not allow for simple analytic solutions. The course's "quick-and dirty" (heuristic) solution techniques will be implemented on microcomputers. Prerequisite: MGTSC 501, 511, 521 or Instructor's permission.

**MGTSC 665 Management of New Technology**

★3 (fi 6) (either term, 3-0-0). In many firms, new technology has the potential to increase competitive advantage. This course looks at the development of products and services which embody new scientific and technical information, and the incorporation of up-to-date technical information in manufacturing and distribution systems. The main thrust of the course will be decisions on the profitable development and adoption of new technology, but there will also be some consideration of policies for government-business cooperation in stimulating and using new inventions and discoveries. The course will include a mix of cases and lectures designed to focus on the significant ways in which new technology can increase profit potential. Prerequisite: MGTSC 501, 511, 521 or Instructor's permission.

**MGTSC 675 Environmental Operations Management**

★3 (fi 6) (either term, 3-0-0). Decision-support models for managerial decisions with environmental impact. Examination of issues such as energy planning, water resource choices and hazardous waste logistics with management science tools. Multicriteria decision making will be introduced and applied.

**MGTSC 698 Individual Study Project in Management Science**

★3 (fi 6) (either term, 3-0-0).

**MGTSC 701 Seminar in Mathematical Programming**

★3 (fi 6) (either term, 3-0-0). Topics from the areas of linear programming, non-linear programming, quadratic programming, integer programming, stochastic programming, network analysis, and large-scale programming (decomposition and column generation) in a business context. Prerequisite: consent of Department.

**MGTSC 702 Seminar in Decision Analysis and Game Theory**

★3 (fi 6) (either term, 3-0-0). Decision-making under uncertainty, analysis of competitive strategies, competitive bidding, theory of auctions, bargaining, and negotiation models. Prerequisite: consent of Department.

**MGTSC 703 Advanced Applications of Operations Research**

★3 (fi 6) (either term, 3-0-0).

**MGTSC 704 Seminar in Stochastic Systems**

★3 (fi 6) (either term, 3-0-0). Topics from the areas of Markov processes, queuing, stochastic dynamic programming, and simulation in a business context. Prerequisite: consent of Department.

**MGTSC 705 Multivariate Data Analysis I**

★3 (fi 6) (either term, 3-0-3).

**MGTSC 706 Multivariate Data Analysis II**

★3 (fi 6) (either term, 3-0-3).

**MGTSC 820 Data Analysis and Modeling**

★3 (fi 32) (first term, 3-0-0). Developing the ability to collect information and to use information technology to analyze statistically and draw conclusions; developing computer skills and understanding research methods. Restricted to Executive MBA students only.

**MGTSC 830 Operations Management**

★3 (fi 32) (second term, 3-0-0). Understanding the strategic role of operations in an enterprise and the relationship between operations and other business functions; designing, implementing and controlling an effective and efficient operating process. Restricted to Executive MBA students only.

**211.146 Managerial Economics**

Department of Marketing and Economic Analysis  
Faculty of Business

programs that require Business courses to meet degree requirements and who have obtained prior approval of their Faculty.

**211.146.1 Graduate Courses****MANEC 501 Microeconomics for Managers**

★1.5 (fi 3) (either term, 18 hours). This course explains actual decision making in economic terms using demand and supply and relying on the concepts of substitutes and opportunity cost. The importance of marginality to decision making is emphasized. Offered in a six-week period.

**MANEC 511 Economic Structure of Government and Business**

★1.5 (fi 3) (either term, 18 hours). This course deals with two aspects of economic structure. First, the structure of real world markets is explained using the theories of competition and monopoly in which the meaning of profit plays a central role. Second, the structure of the relationship between government and business is examined in terms of the public choice and public interest theories of government decision making. The impact of interest groups is viewed through the theory of rent seeking. Offered in a six-week period. Prerequisite: MANEC 501.

**MANEC 512 Macroeconomics for Managers**

★1.5 (fi 3) (either term, 18 hours). This course deals with the measurement of macroeconomic variables, the sources of economic growth, business cycles, interest rates, exchange rates, government debt, and other topics. Offered in a six-week period. Prerequisite: MANEC 501.

**MANEC 541 The International Business Environment**

★1.5 (fi 3) (either term, 18 hours). This course analyzes the economic, political, and cultural forces shaping the international business environment. It assesses Canada's position in the world economy, introduces the forms of international business, explains the pattern of international trade in goods and services, and explores the motives for foreign direct investment. The course discusses and evaluates various government policies to influence international trade and investment and the nature of various international organizations. Offered in a six-week period. Prerequisites: MANEC 511 and 512.

**MANEC 614 Competitive Strategy**

★3 (fi 6) (either term, 3-0-0). An analysis of the ways firms develop and implement competitive plans with an emphasis on underlying economic factors. Consideration is given to market definition; competitive conditions analysis; pricing; government; regulation; and long-term dynamic forces driving competition. Prerequisite: MANEC 501, 511, 512.

**MANEC 646 International Business**

★3 (fi 6) (either term, 3-0-0).

**MANEC 654 Doing Business in Japan**

★3 (fi 6) (either term, 3-0-0). The course explores the historical development of the key economic and social institutions which have shaped the Japanese business environment. There will be special focus on how these institutions have evolved, and to what extent they continue to be relevant. The notion that Japanese management practices are particularly unique will be challenged. Students will explore the evidence which suggests that such practices have become an obstacle in an environment of structural adjustment in the context of a deep business cycle. The course will be forward looking, with a focus on what type of economic structure Japan will have in the future, and what type of management and marketing strategies will be best suited to the new Japan. Prerequisite: MANEC 512.

**MANEC 664 Tax Factors in Business Decision Making**

★3 (fi 6) (either term, 3-0-0). Analysis of the tax factors relevant to the policy and operating decisions in business. Emphasis is on income taxation, especially corporate income taxation. The interests of general business executives are stressed rather than the detailed problems confronting tax specialists. An additional objective is to give sufficient background for an appraisal of the business and economic effects of proposed new developments in taxation and to understand implications from the standpoint of public policy. Prerequisites: MANEC 501, 511, 512.

**MANEC 678 Government Involvement in Business Management**

★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. Prerequisite: MANEC 501, 511, 512.

**MANEC 686 Selected Topics in Managerial Economics**

★3 (fi 6) (either term, 3-0-0).

**MANEC 820 Business Economics**

★3 (fi 32) (first term, 3-0-0). Outlining the main schools of economic theory,

**Note:** Enrolment in all MANEC courses is restricted to students registered in the Faculty of Business, or to students registered in specified

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.

#### **MANEC 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.

#### **MANEC 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.

### **211.147 Marine Science (Biological Sciences)**

Department of Biological Sciences Staff, Marine Station at  
Bamfield, BC  
Faculty of Science

#### **Notes**

- (1) Courses are offered at Bamfield Marine Station (BMS). Details are available from the Department of Biological Sciences.
- (2) Prerequisite for all of the following courses is consent of the Department of Biological Sciences.
- (3) Students will be expected to take a full course load of ★15 during the fall term.
- (4) See also §172.10.

#### **211.147.1 Undergraduate Courses**

##### **MA SC 400 Directed Studies**

★3 (*fi 6*) or ★6 (*fi 12*) (full session, 0-0-6). A course of directed studies under the supervision of a visiting professor. The study will involve a research project approved by the supervisor in the field of interest of the student, and will be designed to take maximum advantage of the laboratory and/or field opportunities offered by the Bamfield Marine Station.

##### **MA SC 401 Special Topics in Marine Biology**

★6 (*fi 12*) (full session, 0-0-6). Offered, as opportunities arise, by distinguished scientists who are working at the Bamfield Marine Station. It is expected that the course will generally be of a specialized nature and be at a level appropriate to graduate or senior undergraduate students.

##### **MA SC 402 Special Topics in Marine Biology**

★3 (*fi 6*) (either term, 0-0-6). Offered, as opportunities arise, by distinguished scientists who are working at the Bamfield Marine Station and are prepared to offer a course extending over a three-week period. Course will be of a specialized nature.

##### **MA SC 403 Directed Studies in Marine Science**

★3 (*fi 6*) or ★6 (*fi 12*) (first term, 13 weeks). Study will involve a research project approved by a supervisor in the student's field of interest, and will be designed to take maximum advantage of the laboratory and/or field opportunities. Students may arrange for a supervisor before the start of the fall semester. Advanced students may, with the permission of their university, take a ★6 directed study in lieu of one of MA SC 415, 425, or 437.

##### **MA SC 410 Marine Invertebrate Zoology**

★6 (*fi 12*) (full session, 0-0-6). A survey of the marine phyla, with emphasis on the benthic fauna in the vicinity of the Bamfield Marine Station. The course includes lectures, laboratory periods, field collection, identification, and observation. Emphasis is placed on the study of living specimens in the laboratory and in the field.

##### **MA SC 412 Biology of Fishes**

★6 (*fi 12*) (full session, 0-0-6). Classification, physiology, ecology, behavior and zoogeography of fishes with particular emphasis on those in the marine environment of the British Columbia coast. Course will involve some field projects.

##### **MA SC 415 Structure and Function in Animals**

★3 (*fi 6*) (first term, 4 weeks). This course is intended to examine the form and function of invertebrates and vertebrates using a comparative approach. The following subject areas will be included: morphology and evolution, systems physiology, biomechanics, and development. The local marine and coastal fauna will be used to illustrate the principles. The course will include fieldwork and a series of laboratory exercises and experiments.

##### **MA SC 420 Marine Phycology**

★6 (*fi 12*) (full session, 0-0-6). A survey of the marine algae, with emphasis on the benthic forms in the vicinity of the Bamfield Marine Station. The course includes lectures, laboratory periods, field collection, identification,

and observation. Emphasis is placed on the study of living specimens in the laboratory and in the field.

##### **MA SC 425 Ecological Adaptations of Seaweeds**

★3 (*fi 6*) (first term, 4 weeks). The course will explore morphological, physiological, genetic and reproductive adaptations of seaweeds to their natural and man-altered environments.

##### **MA SC 430 Marine Ecology**

★6 (*fi 12*) (full session, 0-0-6). An analytical approach to biotic associations in the marine environment. Opportunities will be provided for study of the intertidal realm in exposed and protected areas and of beaches and estuaries in the vicinity of the Bamfield Marine Station; plankton studies and investigations of the subtidal and benthic environments by diving and dredging are envisaged.

##### **MA SC 437 Marine Population Ecology and Dynamics**

★3 (*fi 6*) (first term, 4 weeks). An analytical approach to the study of marine ecology and marine populations. Intertidal and subtidal communities will be examined, with emphasis on the biota of the Barkley Sound region.

##### **MA SC 440 Biology of Marine Birds**

★6 (*fi 12*) (full session, 0-0-6). A study of the interrelationship of birds and the marine environment. Lectures will emphasize the systematics and ecological relationships, behavior, life histories, movements and conservations of marine birds. Census techniques and methods of studying marine birds in the field will be treated as we observe seabirds and marine associated birds in the Barkley Sound region. Seabird identification, classification, morphology, plumages and moult will be examined in the laboratory.

##### **MA SC 445 Biology of Marine Mammals**

★6 (*fi 12*) (full session, 0-0-6). A survey course covering systematics and distribution of marine mammals, their sensory capabilities and physiology, with special emphasis on the Cetacea. The course includes lectures, laboratory periods and the course will involve an independent field study.

##### **MA SC 450 Principles of Aquaculture**

★3 (*fi 6*) (either term, 0-0-6). An interdisciplinary introduction to the principles underlying the commercial cultivation of aquatic plants and animals emphasizing marine systems. The course will include working site-visits to a range of commercial farms and R & D facilities.

##### **MA SC 454 Special Topics in Aquaculture**

★3 (*fi 6*) (either term, 0-0-6). An examination of the culture techniques for selected groups of aquatic plants, animals, or micro organisms. Participants will be expected to complete a project which examines some aspects of applied science relevant to commercial culture.

##### **MA SC 470 Directed Research in Aquaculture**

★3 (*fi 6*) (either term, 0-0-6). Design and execution of a research project in the field of aquaculture under the supervision of a scientist working in association with the Bamfield Station. A written report is a requirement.

##### **MA SC 480 Seminars and Papers in Marine Science**

★3 (*fi 6*) (first term, 13 weeks). A series of weekly seminars covering current topics of interest in the marine sciences. Seminars will be presented by BMS researchers, graduate students, visiting scientists as well as by the students themselves.

#### **211.147.2 Graduate Courses**

##### **MA SC 500 Graduate Level Directed Studies**

★6 (*fi 12*) (full session, 0-0-6). A graduate level course of directed studies under the supervision of a member of the faculty. The study will involve a research project provided by the supervisor in the field of interest of the student, and will be designed to take maximum advantage of the laboratory and/or field opportunities offered at Bamfield Marine Station. May be offered over a 3-week period.

##### **MA SC 501 Graduate Level Special Topics**

★6 (*fi 12*) (full session, 0-0-6). Courses offered, as opportunities arise, by distinguished scientists who are visiting at Bamfield Marine Station. It is expected that the course will generally be of a specialized nature and will carry graduate credit.

##### **MA SC 502 Graduate Level Special Topics**

★3 (*fi 6*) (full session, 0-0-6). Courses offered as opportunities arise, by distinguished scientists who are visiting at Bamfield Marine Station and are prepared to offer a course extending over a three-week period. The course will carry graduate credit.

### **211.148 Marketing**

Department of Marketing, Business Economics and Law  
Faculty of Business

**Note:** Enrolment in all MARK 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.

### 211.148.1 Undergraduate Courses

#### MARK 301 Fundamentals of Marketing

★3 (fi 6) (either term, 3-0-0). The marketing concept, market segmentation and measurement, buyer behavior, marketing planning and budgeting, strategic and tactical decisions concerning elements of the marketing mix. Prerequisites: ECON 101/102, MATH 113 or equivalent.

#### MARK 412 Marketing Research

★3 (fi 6) (either term, 3-0-0). Nature and significance of marketing research. Marketing research methods; investigation and analysis of specific research problems. Prerequisite: MARK 301.

#### MARK 422 Consumer Behavior

★3 (fi 6) (either term, 3-0-0). The study of the factors affecting the consumer decision process. Analysis of consumer behavior models and their application to marketing decision making, with an emphasis on empirical research. Prerequisite: MARK 301. BCom degree credit will not be granted for both MARK 422 and CONS 220.

#### MARK 423 Advanced Topics in Consumer Behavior

★3 (fi 6) (either term, 3-0-0). Advanced study of consumer behavior theories and their application to consumer research that informs marketing, consumer policy, and consumer education. Prerequisite: MARK 422 or CONS 220. BCom degree credit will not be granted for both MARK 423 and CONS 420.

#### MARK 432 Advertising and Promotion

★3 (fi 6) (either term, 3-0-0). Management of advertising and other marketing communications tools. Primary emphasis is on advertising, but other components of the promotion mix, such as direct marketing, sales promotion, public relations, and personal selling are included for an integrated view of marketing communications. Prerequisite: MARK 301.

#### MARK 442 Seminar in International Marketing

★3 (fi 6) (either term, 3-0-0). Analysis of problems of international marketing; development of marketing strategies in light of world cultural, economic, geographic, legal and political factors. Prerequisite: MARK 301.

#### MARK 452 Marketing Decision Simulation

★3 (fi 6) (either term, 3-0-0). Marketing decision making in a dynamic simulated environment. Emphasis on a computerized marketing decision game, plus readings in the literature. Prerequisite: MARK 301.

#### MARK 465 Retailing and Services Internship

★3 (fi 6) (either term, 3-0-0). Practical application of marketing and related business skills and theory to a problem or issues addressed during a period of 13 weeks of summer placement in a sponsoring retailing or services organization. The internship includes preliminary instruction and requires, under the supervision of the Faculty, the presentation of a project report to the sponsoring organization. Prerequisites: MARK 301 and consent of Department.

#### MARK 466 Delivering Service Quality

★3 (fi 6) (either term, 3-0-0). Importance of service quality to consumers and industrial customers for products or services in the private, not-for-profit, and government sectors. Emphasizes identifying customer/client perceptions for quality service, designing service specifications, and measuring and overcoming barriers to service performance. Prerequisite: MARK 301.

#### MARK 468 Retail Management

★3 (fi 6) (either term, 3-0-0). Planning and managing enterprises. Topics include: location theory; competition analysis; pricing, promotion, and merchandising strategies; business design; buying/supplier policies; and consumer behavior. Prerequisite: MARK 301.

#### MARK 470 Selling and Sales Management

★3 (fi 6) (either term, 3-0-0). The role of selling and management of the sales force in diverse modern business environments. Topics include: sales strategies, sales force planning, organization and evaluation, recruiting, selection and training, leadership and motivation, sales forecasting, quotas, and types of compensation. Prerequisite: MARK 301.

#### MARK 472 Product Management and Pricing

★3 (fi 6) (either term, 3-0-0). Development, management and pricing of interrelated goods and services. New product development, managing a product portfolio, bundling of goods and services, and tailoring price and product to different segments. Prerequisites: MARK 301 and BUEC 311.

#### MARK 474 Industrial Marketing Strategy

★3 (fi 6) (either term, 3-0-0). Nature and importance of industrial marketing strategy analysis of industrial marketing problems; cases will be used to explore selected dimensions of industrial marketing in depth. Prerequisite: MARK 301.

#### MARK 475 Marketing Management

★3 (fi 6) (either term, 3-0-0). Advanced marketing strategy and planning in consumer marketing organizations. Prerequisite: MARK 301.

#### MARK 488 Marketing Policies and Problems

★3 (fi 6) (either term, 3-0-0). Special topics in marketing, to be announced in advance by the instructor. Prerequisite: MARK 301.

#### MARK 495 Individual Research Projects

★3 (fi 6) (either term, 3-0-0). Special study for advanced undergraduates. Prerequisites: MARK 412 or equivalent, consent of Instructor and Associate Dean. (When a student registers in this course for a second or third time, subsequent higher course numbers are to be used: MARK 496, 497.)

### 211.148.2 Graduate Courses

#### MARK 501 Fundamental Concepts of Marketing

★1.5 (fi 3) (either term, 18 hours). This course covers basic concepts in marketing, including marketing orientation, relationship marketing, the marketing research process, consumer vs industrial marketing, uncontrollable vs controllable variables, market segmentation, and development of a marketing plan. The course also introduces marketing in special contexts such as not-for-profit, international, services, and environmental. Offered in a six-week period.

#### MARK 511 Marketing Management

★1.5 (fi 3) (either term, 18 hours). This course addresses in detail the concept of the marketing mix: product, price, place, and promotion. While each of these elements is covered separately, the need to synchronize them is emphasized. The course focuses on implementing the marketing mix. Offered in a six-week period. Prerequisites: MARK 501, MANEC 501.

#### MARK 614 Marketing Research

★3 (fi 6) (either term, 3-0-0).

#### MARK 615 Quantitative Marketing Management

★3 (fi 6) (either term, 3-0-0). An introduction to quantitative modelling in marketing applying tools drawn from management science, statistics, economics, and accounting to marketing problems. Computer use is an integral part of project assignments. Prerequisite: MARK 502.

#### MARK 624 Consumer Behavior

★3 (fi 6) (either term, 3-0-0). Individual and group influences on consumer decision-making and their implications for marketing strategy. Individual influences examined include personality, attitude, attitude change, and image. Group influences include reference groups such as family, social class, culture, and sub-culture. Prerequisite: MARK 502.

#### MARK 634 Advertising and Promotion

★3 (fi 6) (either term, 3-0-0). Management of advertising and other marketing communications tools. Primary emphasis is on advertising, but other components of the promotion mix, such as direct marketing, sales promotion, public relations, and personal selling are included, providing an integrated view of marketing communications. Prerequisites: MARK 501 and 511.

#### MARK 644 International Marketing

★3 (fi 6) (either term, 3-0-0). Topics in international marketing, including the importance of international marketing to Canadian business, comparative marketing systems, evaluation of socioeconomic influences on international marketing, and marketing strategies as they relate to firm size. Prerequisites: MARK 501, 511.

#### MARK 654 Strategic Marketing

★3 (fi 6) (either term, 3-0-0).

#### MARK 664 Product Management and Pricing

★3 (fi 6) (either term, 3-0-0). Development, management and pricing of interrelated goods and services. New product development, pricing strategies for new products, managing a product portfolio, bundling of goods and services and pricing the bundles, and tailoring price and product to different segments. Prerequisites: MARK 501, 511, MANEC 511.

#### MARK 666 Service Quality Management

★3 (fi 6) (either term, 3-0-0). The importance of service quality to consumers and industrial customers; for products or services; in the private, not-for-profit, and government sectors. Emphasizes identifying customer/client perceptions for quality service, designing service specifications, measuring and overcoming barriers to service performance. Prerequisite: MARK 502.

#### MARK 668 Retail Management

★3 (fi 6) (either term, 3-0-0). Application of marketing analysis to retail management. Emphasis is placed on: location/spatial theory; market research techniques; consumer behavior; channel policies; competition analysis; and pricing, merchandising, and promotion strategies. Prerequisite: MARK 502.

#### MARK 686 Selected Topics in Marketing

★3 (fi 6) (either term, 3-0-0).

#### MARK 701 Research Methodology in Marketing

★3 (fi 6) (either term, 3-0-0). The nature of scientific inquiry and its relevance

and application to research in marketing. The development and testing of marketing theory. Marketing measurement methodology. Prerequisite: MARK 614 or equivalent.

#### MARK 702 Buyer Behavior

★3 (*fi 6*) (either term, 3-0-0). In-depth study and analysis of the current buyer behavior research literature. Models of individual and group (organizational) buying processes. Information processing views of consumer decision-making. Models of attitudes, perceptions, preferences, and choice. The use of advanced econometric and psychometric techniques in analyzing buyer behavior. Prerequisite: MARK 624 or equivalent.

#### MARK 703 Marketing Modelling

★3 (*fi 6*) (either term, 3-0-0).

#### MARK 704 Individual Research

★3 (*fi 6*) (either term, 3-0-0).

#### MARK 705 Current Research in Marketing

★3 (*fi 6*) (either term, 3-0-0). An overview of recently published research in marketing with an emphasis on the research interests of enrolled students not adequately covered in other marketing doctoral courses.

#### MARK 830 Marketing

★3 (*fi 32*) (second term, 3-0-0). Understanding the role of marketing in determining the direction of an organization; the customer-focused organization; opportunity identification; forecasting demand; marketing segmentation; market planning, and implementation. Restricted to executive MBA students only.

## 211.149 Materials Engineering

Department of Chemical and Materials Engineering  
Faculty of Engineering

The following table lists renumbered courses effective 1993/94:

Old	New	Old	New
MET E 351	MET E 251	MET E 534	MET E 434
MET E 352	MET E 252	MET E 540	MET E 441
MET E 356	MET E 256	MET E 541	MET E 442
MET E 431	MMP E 331	MET E 542	MET E 444
MET E 432	MET E 332	MET E 545	MET E 445
MET E 440	MET E 340	MET E 548	MET E 448
MET E 451	MET E 353	MET E 549	MET E 449
MET E 457	MET E 357	MET E 552	MET E 452
MET E 458	MET E 358	MET E 553	MET E 453
MET E 480	MET E 380	MET E 567	MET E 467
MET E 530	MET E 430		

The following table lists renumbered courses effective 1994/95:

Old	New
MET E 550	MET E 443

The following table lists renumbered courses effective 1997/98:

Old	New	Old	New
MET E 251	MATE 251	MET E 543	MATE 543
MET E 252	MATE 252	MET E 555	MATE 555
MET E 256	MATE 256	MET E 601	MATE 601
MMP E 331	MATE 331	MET E 610	MATE 610
MET E 332	MATE 332	MET E 611	MATE 611
MET E 340	MATE 340	MET E 615	MATE 615
MET E 353	MATE 353	MET E 630	MATE 630
MET E 357	MATE 357	MET E 645	MATE 645
MET E 358	MATE 358	MET E 651	MATE 651
MET E 380	MATE 380	MET E 652	MATE 652
MMP E 390	MATE 390	MET E 653	MATE 653
MMPE 408	MATE 408	MET E 654	MATE 654
MET E 430	MATE 430	MET E 660	MATE 660
MET E 434	MATE 434	MET E 662	MATE 662
Old	New	Old	New
MET E 441	MATE 441	MET E 664	MATE 664
MET E 442	MATE 442	MET E 665	MATE 665
MET E 443	MATE 443	MET E 666	MATE 666
MET E 444	MATE 444	MET E 668	MATE 668
MET E 445	MATE 445	MET E 676	MATE 676
MET E 448	MATE 448	MET E 680	MATE 680
MET E 452	MATE 452	MET E 682	MATE 682
MET E 453	MATE 453	MET E 738	MATE 738
MET E 467	MATE 467	MET E 778	MATE 778
MET E 533	MATE 533		

### 211.149.1 Undergraduate Courses

#### MATE 251 Materials Science I

□3.0 (*fi 6*) (either term, 3-0-0). An introduction to the science of materials

from the standpoint of the relationships between structure and physical and mechanical properties. Atomic bonding, crystal structure and crystal imperfections, binary phase equilibria and phase transformations. Structures of metallic, non-metallic and composite materials. Elastic and plastic deformation, fracture, fatigue and creep in crystalline and amorphous solids. Corrosion and thermal stability of materials in service. Prerequisite: CHEM 105 or consent of Department. (★3)

#### MATE 252 Materials Science II

□3.8 (*fi 6*) (either term, 3-0-3/2). An introduction to the science of materials relating their mechanical, thermal, electronic and chemical properties to atomic, molecular and crystal structure. Ceramic and metallic crystals, glasses, polymers and composite materials. Multi-phase materials, strengthening processes. Laboratories include mechanical properties of metals and polymers, microstructure, heat treatment of steel, corrosion. Prerequisite: CHEM 105. (★3)

#### MATE 256 Materials Engineering

□3.8 (*fi 6*) (second term, 3-0-3/2). Elements of crystallography, x-ray diffraction, and applications in materials. Transmission and scanning electron microscopy as applied to materials. Metallography. Vacancies, introduction to dislocations and grain boundaries in metals. Introduction to powder metallurgy. Polymers and their application in materials engineering. Prerequisite: MATE 252 or equivalent. (★3)

#### MATE 331 Mineral Processing I

□3.8 (*fi 6*) (second term, 3-0-3/2). Unit operations employed to concentrate minerals including comminution, classification, gravity concentration, froth flotation, thickening, filtering; tailings disposal; marketing of minerals; economics. Prerequisite: consent of Instructor. (★3)

#### MATE 332 Pyrometallurgy

□3.8 (*fi 6*) (second term, 3-0-3/2). Nature of ores, furnaces, fuels, slags, mattes and refractories. Metallurgical calculations. Metallurgical unit processes involving the use of elevated temperatures to extract metals including calcining, roasting, reduction, distillation, smelting, converting, refining and casting. Metals discussed include iron and steel, lead, zinc, titanium, tin and copper. Prerequisite: Consent of Instructor. (★3)

#### MATE 340 Metallurgical Thermodynamics and Kinetics

□3.0 (*fi 6*) (first term, 3-0-0). Application of thermodynamics and kinetics to problems in extractive and solid-state metallurgy. Review of thermodynamic variables and mathematical prerequisites. Solution thermodynamics applied to metallurgical reduction and refining processes, phase equilibria. Experimental methods and estimation of thermochemical data, kinetics of homogeneous and heterogeneous metallurgical processes; formal basis of diffusion theory. Prerequisite: CH E 243. (★3)

#### MATE 353 Electronic Materials I

□3.0 (*fi 6*) (first term, 3-0-0). The science of electronic materials relating atomic, molecular and crystal structure to material properties; polymers, glasses, crystalline ceramics, metals, and composites; diffusion, electrochemical and corrosion properties; phase equilibria, strengthening mechanisms, mechanical properties and failure; electrical conductors, semiconductors, and dielectrics; thermal, magnetic, and optical properties. Prerequisite: CHEM 105. Not open to students with credit in MATE 251 or MATE 252. (★3)

#### MATE 357 Fundamentals of Physical Metallurgy

□4.5 (*fi 6*) (first term, 3-0-3). Diffusion in metals. Phase diagrams. Solidification. Solid state phase transformations. Aluminum alloys, properties and selection. Displacive transformations. Carbon and low alloy steels and their heat treatment. Prerequisite: MATE 256. (★3)

#### MATE 358 Mechanical Metallurgy and Electronic Materials

□4.5 (*fi 6*) (second term, 3-0-3). Elasticity, tensile testing and stress strain relationship. Introduction to the dislocation glide and plastic deformation. Strengthening mechanisms in metals. Aluminum alloys. Fundamentals of fracture. Fatigue and creep. Introduction to electronic materials. Prerequisite: MATE 256. (★3)

#### MATE 380 Ceramics

□3.0 (*fi 6*) (second term, 3-0-0). Structure, processing, characterization, properties and application of ceramic materials and glass. Ceramic raw materials. Crystal chemistry and physics. Glassy state. Crystal defects, nonstoichiometry, diffusion, phase diagrams. Powder preparation, ceramic fabrication. Characterization of ceramic powders and components. Thermal, mechanical and electrical properties. Traditional and recent applications. Prerequisite: MATE 256 or consent of Instructor. (★3)

#### MATE 390 Introduction to Process Simulation

□3.5 (*fi 6*) (first term, 3-1s-0). Simulation methods are developed and applied to systems. Topics include probabilistic, deterministic, and numerical simulations of physical processes commonly encountered in mining, metallurgical, and petroleum engineering. Prerequisite: ENCOMP 100. (★3)

#### MATE 408 Environmental Aspects of Resource Operations

□3.0 (*fi 6*) (second term, 3-0-0). Environmental impacts of mining, mineral

processing, and extractive metallurgical operations. Abatement technology. Public response and environmental legislation. Safe disposal of wastes from resource industries. Land reclamation and revegetation methods. Case studies of typical Canadian resource industries. Prerequisite: MATE 331 or consent of Instructor. (★3)

#### **MATE 430 Hydrometallurgy and Electrometallurgy**

□3.8 (*fi 6*) (first term, 3-0-3/2). Principles and applications of hydrometallurgical and electrometallurgical processes to extract metals: atmospheric and pressure leaching, ion exchange, solvent extraction, hydrogen reduction, electrowinning and electrorefining. Metals discussed include copper, nickel, cobalt, uranium, zinc, aluminium and magnesium. Prerequisite: MATE 340 or consent of Instructor. (★3)

#### **MATE 434 Metallurgical Process Analysis**

□3.8 (*fi 6*) (second term, 3-0-3/2). The analysis, optimization and control of mineral and metallurgical processing systems through mathematical modelling and digital simulation. Instrumentation and control of metallurgical processing plants. Prerequisite: MATE 331, 332 or 390. (★3)

#### **MATE 441 Metallurgical Research Project I**

□1.5 (*fi 4*) (first term, 0-0-3). Research on current topics in metallurgical and mineral engineering, including physical, chemical and mechanical metallurgy, and mineral processing. Literature survey on a specific topic and submission of a detailed research proposal. Corequisite: MMP E 499. (★2)

#### **MATE 442 Metallurgical Research Project II**

□3.0 (*fi 6*) (either term, 0-0-6). Execute research according to research proposal prepared in MATE 441. Write research report. Prerequisite: MATE 441. Corequisite: MATE 449. (★3)

#### **MATE 443 Materials Design Project**

□4.0 (*fi 6*) (second term, 2-1s-3). Team or individual materials design projects. Selection and optimization of physical/mechanical properties and fabrication processes for chosen components or structures. Prerequisites: CIV E 270, MATE 452. (★3)

#### **MATE 444 Metallurgical Plant Design and Operation**

□3.5 (*fi 6*) (second term, 2-0-3). Fundamental concepts of design, flowsheet layout, cost estimation, profitability analysis, equipment sizing and selection, maintenance scheduling and operating practices. Prerequisite: MATE 331. (★3)

#### **MATE 445 Corrosion and Oxidation**

□3.0 (*fi 6*) (either term, 3-0-0). Electrochemical theory of galvanic attack, concentration cells and differential temperature cells. Uniform attack. The interaction of mechanical stresses and corrosion. Selection of corrosion-resistant materials. Protective coatings, inhibitors and cathodic protection, corrosion testing, high-temperature oxidation and other gas-metal reactions. Prerequisite: MATE 251 or 252. (★3)

#### **MATE 448 Metallurgical Field Trip**

□0.5 (*fi 1*) (either term, 0-1s-0). An extended trip to visit mining and metallurgical plants is made in the fall of odd-numbered years by Third- and Fourth-Year Metallurgical Engineering students accompanied by staff. Fourth-Year students in Metallurgy may also be required to make several part-day trips during the session to mining, metallurgical and other industrial plants near Edmonton. This course requires the payment of additional miscellaneous fees. See §22.2.3 for details. Prerequisite: MATE 256. (★0.5)

#### **MATE 452 Applications of Physical Metallurgy**

□4.5 (*fi 6*) (first term, 3-0-3). Composition, structure, heat treatment and mechanical properties of alloy steels, cast irons and non-ferrous alloys excepting aluminum. Mechanical processing of metals, including stress-strain relationships, forging, rolling, extrusion and sheet metal forming. Metallurgy of machining. Prerequisite: MATE 357. (★3)

#### **MATE 453 Applications of Physical Metallurgy II**

□3.8 (*fi 6*) (second term, 3-0-3/2). Solidification processing, deformation processing. Metal working by forging, rolling and drawing. Powder metallurgy. Metallurgy of welding and joining. Prerequisite: MATE 452 or 350. (★3)

#### **MATE 467 Polymers and Fibre Reinforced Polymers**

□3.5 (*fi 6*) (either term, 3-1s-0). Introduction. Structure and behavior of polymers. Polymer processing techniques. Stiffness and strength of polymers. Fracture of polymers. Fibre-polymer composites. Fluid flow and heat transfer in melt processing. Interactions of processing and properties. Polymer adhesives. Prerequisite: MATE 252 or equivalent. (★3)

#### **MATE 533 Mineral Processing II**

□2.8 (*fi 4*) (either term, 2-0-3/2). Chemical and mineralogical analyses of ores, metallurgical testing, process evaluation, flowsheet development and economic evaluation. Prerequisite: MATE 331. (★2)

#### **MATE 543 Special Topics in Metallurgy**

□3.0 (*fi 6*) (either term, 3-0-0). Physical and chemical principles underlying metallurgical topics of current interest such as composite materials, materials problems in energy conversion, electrofinishing, recycling, extraction of metals from fossil fuels, iron and steelmaking, and refractory-slag interactions. (★3)

#### **MATE 555 Special Topics in Metal Processing**

□3.0 (*fi 6*) (second term, 3-0-0). Studies of the metallurgical background of specific metal processing techniques which are of current interest. Prerequisite: MATE 452 or 350. (★3)

### 211.149.2 Graduate Courses

#### **MATE 601 Research Techniques in Metallurgy**

□3.5 (*fi 6*) (either term, 2-0-3). Statistical analysis, electron diffraction, crystal growth, diffuse scattering of x-rays, electron emission, high speed strain measurements, internal friction and radioactive tracers. Zone refining, high pressure and vacuum processes. (★3)

#### **MATE 610 Welding Metallurgy**

□3.8 (*fi 6*) (second term, 3-0-3/2). Heat flow. Effect of welding thermal cycles on weld joints. Weld metal solidification. Metallurgical changes during solidification. Heat-affected zones. Residual stresses and distortion. Ferrous alloy metallurgy. Nonferrous alloy metallurgy. Dissimilar metal joints. Metallurgy of brazing and soldering. Prerequisite: MATE 452 or equivalent. (★3)

#### **MATE 611 Welding Processes**

□3.8 (*fi 6*) (first term, 3-0-3/2). Process classification and selection. Welding heat sources. Heat transfer, metal transfer, gas-metal and slag-metal reactions. Power source characteristics. Analysis of industrial arc welding processes. Cutting processes. Surfacing and metal spraying. Resistance welding. Solid phase bonding. Brazing and soldering. Welding of plastics. Adhesive bonding. Prerequisite: consent of Instructor. (★3)

#### **MATE 615 Quality Control of Weldments**

□3.8 (*fi 6*) (either term, 3-0-3/2). Quality assurance schemes and audits; destructive and non-destructive testing methods; fabrication code requirements and fitness-for-purpose criteria; welding procedures; statistical methods; case studies. Prerequisites: MATE 610 and 611 or consent of Instructor. (★3)

#### **MATE 630 Special Topics in Process Metallurgy**

□3.0 (*fi 6*) (either term, 3-0-0). Topics of current interest related to process metallurgy, such as process analysis, mathematical modelling and simulation, metal extraction from secondary sources, iron and steel making, physical chemistry of molten systems and production of industrial minerals. (★3)

#### **MATE 645 Electrochemical Processes**

□3.0 (*fi 6*) (either term, 3-0-0). Aqueous, molten and solid electrolytes: thermodynamics, structure, transport properties. Applications of conductivity measurements. Electrodes: types, reactions, potential. Electrochemical cells. Applications of EMF measurements. Electrical double layer, electrode kinetics, overpotential. Chlor-alkali industry, electrometallurgy, electrolysis of water, electroplating. Electrochemical energy conversion: primary and secondary batteries, fuel cells. High temperature applications. Prerequisite: MATE 430 or consent of Instructor. (★3)

#### **MATE 651 High-Temperature Oxidation**

□3.0 (*fi 6*) (first term, 3-0-0). Lattice defects and diffusion in crystals. Theories of metal oxidation mechanisms. Mechanisms of alloy oxidation. Oxidation by gases other than oxygen. Experimental research methods. Protection of metal surfaces from oxidation. Prerequisite: MATE 445 or consent of Instructor. (★3)

#### **MATE 652 Soil Corrosion and its Prevention**

□3.0 (*fi 6*) (second term, 3-0-0). The chemical and physical character of soils; soil surveys and tests; estimation of corrosivity. Types of corrosion, including microbial corrosion, stray currents, stress corrosion. Detecting corrosion with potential measurements, line current, and earth current measurements. Methods of reducing corrosion. Cathodic protection principles, design, testing and measurement. Cathodic equipment and problems. Corrosion control management and economics. Prerequisite: MATE 445 or consent of Instructor. (★3)

#### **MATE 653 Stress Corrosion Cracking**

□3.0 (*fi 6*) (first term, 3-0-0). The role of corrodents, stresses and microstructure in the phenomena of stress corrosion cracking; dissolution models and mechanical models proposed as mechanisms. Stress corrosion of high-strength steels, stainless steels and the principal nonferrous metals. Stress corrosion testing and methods of preventing stress corrosion cracking. Prerequisite: MATE 445 or consent of Instructor. (★3)

#### **MATE 654 Electrochemical Theory of Corrosion**

□3.0 (*fi 6*) (second term, 3-0-0). Principles and applications of electrochemical corrosion theory in basic and applied research. Equilibrium thermodynamics and electrode kinetics. Passivation and breakdown of passivity. The study of galvanic corrosion; alloy evaluation. Corrosion testing methods and electrochemical measurement of corrosion rates. Prerequisite: MATE 445 or consent of Instructor. (★3)

#### **MATE 660 Metallurgical Applications of X-rays**

□3.0 (*fi 6*) (either term, 3-0-0). Production and detection of x-rays; x-ray fluorescence spectroscopy; electron probe microanalysis; interaction of x-rays

with crystals; reciprocal lattice construction; single crystal diffraction patterns; powder diffractometry and measurement of preferred orientations, stress, particle size, etc.; x-ray absorption microscopy; x-ray diffraction microscopy. Prerequisite: MATE 357 or consent of Instructor. (★3)

#### MATE 662 Fracture of Metals

□3.0 (*fi 6*) (either term, 3-0-0). Theoretical strength of solids, Griffith crack theory, mechanisms of brittle and ductile fracture, the ductile to brittle transition, fatigue and creep fracture, environmental effects on fracture. Prerequisites: MATE 350, 358, or consent of Instructor. (★3)

#### MATE 664 Diffusion and Diffusion-Controlled Processes in Metallurgy and Materials

□3.0 (*fi 6*) (either term, 3-0-0). Fundamentals of diffusion, diffusion in dilute alloys, diffusion in a concentration gradient, diffusion in non-metals, high diffusivity paths, thermal diffusion. Applications to materials: sintering, superplasticity, creep, metal oxides and non-stoichiometry. (★3)

#### MATE 665 Materials Applications of Transmission Electron Microscopy

□4.5 (*fi 6*) (either term, 3-0-3). Principles and design of the transmission electron microscope, specimen preparation, electron diffraction, image contrast theory, introduction to analytical electron microscopy. Applications to defects in metallic and non-metallic crystalline materials. Prerequisite: MATE 358 or consent of Instructor. (★3)

#### MATE 666 Materials Applications of Scanning Electron Microscopy

□3.0 (*fi 6*) (either term, 3-0-0). Principles and design of the scanning electron microscope, electron beam-specimen interactions, image formation, x-ray microanalysis in the scanning electron microscope, specimen preparation, application to materials analysis. Prerequisite: MATE 358 or consent of Instructor. (★3)

#### MATE 668 Colloidal Ceramics Processing

□3.0 (*fi 6*) (first term, 3-0-0). Principles and application of colloidal materials to the fabrication of advanced ceramics. Synthesis of fine powders, sols and gels; study of their properties, phase transformation and sintering behavior during heat treatment. Colloidal ceramics composites. Prerequisite: MATE 380 or consent of Instructor. (★3)

#### MATE 676 Special Topics in Physical Metallurgy

□3.0 (*fi 6*) (either term, 3-0-0). Subjects of current interest such as kinetics of heterogeneous nucleation and phase transformations in solids, grain boundary phenomena, internal friction, physics and chemistry of friction and wear. (★3)

#### MATE 680 Ceramics

□3.0 (*fi 6*) (either term, 3-0-0). Important ceramic materials and products, processing, typical properties. Structure: binary and ternary compounds, crystalline silicates, glass. Point defects, nonstoichiometry, defect reactions, dislocations. Diffusion, electrochemical transport, examples. Thermal and mechanical properties, thermal shock resistance, electrical conduction. Applications: solid electrolytes, energy conversion systems, refractories, electronics. Prerequisites: MATE 332 and 357 or consent of Instructor. (★3)

#### MATE 682 Graduate Seminar

□0.5 (*fi 2*) (variable, 0-1s-0). Discussion of progress and problems in research underway in the metallurgical area. Graduate students are required to attend and to give a seminar related to their research. (★1)

#### MATE 738 Process Metallurgy

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MATE 778 Physical Metallurgy

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MATE 900 Directed Research

★6 (*fi 12*) (variable). An engineering project for students registered in a Master of Engineering program.

211.150 Reserved

## 211.151 Mathematical Physics

Departments of Mathematical Sciences and Physics  
Faculty of Science

### 211.151.1 Undergraduate Courses

**Note:** Permission to enrol in any mathematical physics course will not normally be granted unless the stated prerequisites have been met. However, students may enrol in a mathematical physics course if their department and the course instructor agree that their background and academic standing warrant the waiver of the stated prerequisites.

#### MA PH 343 Classical Mechanics I

★3 (*fi 6*) (first term, 3-0-0). Principles of mechanics; non-inertial frames;

Lagrange's equations and Hamilton's principle; dynamics of oscillating systems; rigid body kinematics and dynamics; Hamiltonian methods and canonical transformations. Prerequisite: PHYS 244. Corequisite: MATH 215 or 317.

#### MA PH 451 Mathematical Methods of Physics I

★3 (*fi 6*) (first term, 3-0-0). Application to problems in physics of method of steepest descent, Fourier and Laplace transforms; boundary-value problems, integral equations, and Green's functions. Prerequisites: PHYS 372 and 381. Corequisite: PHYS 481.

#### MA PH 453 Mathematical Methods of Physics II

★3 (*fi 6*) (second term, 3-0-0). Group representation theory and applications to problems in physics; spectral theory for matrices; application to the theory of resolvents and their relation to Green's functions; calculus of variations; integral representations of special functions. Prerequisite: MA PH 451.

#### MA PH 467 Mechanics of Deformable Media

★3 (*fi 6*) (second term, 3-0-0). Stress and strain in continuous media; elasticity; mechanics of fluid flow in two dimensions using complex variables; three dimensional fluid flow using Eulerian and Lagrangian reference frames; thermodynamics and mechanics of compressible and viscous flows; onset of turbulence, convection, and instability. Examples from geophysics, oceanography, and atmospheric physics. Prerequisites: PHYS 211, MATH 334, MA PH 343, and MATH 411 or 311.

#### MA PH 468 Introduction to Relativity

★3 (*fi 6*) (second term, 3-0-0). Special relativity; principle of equivalence; Einstein field equations; stationary and static fields; Schwarzschild metric, experimental tests; black holes; linearized equations; gravitational collapse; cosmology. Prerequisite: PHYS 351 or MATH 446 or equivalent.

### 211.151.2 Graduate Courses

**Note:** The following undergraduate courses may be taken for graduate credit: MA PH 343, 451, 453, 467, 468.

#### MA PH 669 General Relativity

★6 (*fi 12*) (full session, 3-0-0). Algebraic analysis of the field equations, Cauchy initial value problem, gravitational radiation, algebraically special fields, conservation laws, gravitational collapse and black holes. Relativistic astrophysics, cosmological models, global structure of space-time. Prerequisite: MATH 446 or consent of both Departments.

## 211.152 Mathematics

Department of Mathematical Sciences  
Faculty of Science

### Notes

- (1) MATH 100, 101, 102, 201, 209, 300, 301, 311 are open to Engineering students only.
- (2) See Mathematical Physics listing for courses offered jointly by the Physics and Mathematics Departments.
- (3) See also Mathematical Physics listing.

### 211.152.1 Undergraduate Courses

#### MATH 100 Calculus I

□4.0 (*fi 6*) (either term, 3-0-2). Rectangular and polar coordinates, analytic geometry. Transcendental functions, limits, continuity, derivatives and applications. Taylor polynomials. Integration and applications. Prerequisites: Mathematics 30 and 31. Notes: (1) This course may not be taken for credit if credit has already been obtained in MATH 113, 114, or 117. (2) Students in all sections of this course will write a common final examination. (3) Restricted to Engineering students. (★3)

#### MATH 101 Calculus II

□3.5 (*fi 6*) (either term, 3-0-1). Applications of integration to lengths, areas, volumes, and masses. Inverse trigonometric and hyperbolic functions. Methods of integration, polar and parametric equations. Vector functions and derivatives. Prerequisite: MATH 100. Notes: (1) This course may not be taken for credit if credit has already been obtained in either MATH 115 or 118. (2) Students in all sections of this course will write a common final examination. (3) Restricted to Engineering students. (★3)

#### MATH 102 Applied Linear Algebra

□3.5 (*fi 6*) (either term, 3-0-1). Vectors and matrices, solution of linear equations, equations of lines and planes, determinants, matrix algebra, orthogonality and applications (Gram-Schmidt), eigenvalues and eigenvectors and applications, complex numbers. Prerequisite or corequisite MATH 100. Notes: (1) This course may not be taken for credit if credit has already been obtained in MATH 120 or 127. (2) Students in all sections of this course will write a common final examination. (3) Restricted to Engineering students. (★3)

**S** **MATH 113 Elementary Calculus I**

★3 (*fi 6*) (either term, 3-0-1). Review of analytic geometry. Differentiation and integration of simple functions. Applications. Prerequisite: Mathematics 30 or equivalent. Students who have taken Mathematics 31 are advised to take MATH 114. This course may not be taken for credit if credit has already been obtained in MATH 100, 114 or 117.

**S** **MATH 114 Elementary Calculus I**

★3 (*fi 6*) (either term, 3-0-0). The course description is the same as for MATH 113. Prerequisites: Mathematics 30, Mathematics 31 or equivalent. This course may not be taken for credit if credit has been obtained in MATH 100, 113 or 117.

**S** **MATH 115 Elementary Calculus II**

★3 (*fi 6*) (either term, 3-0-0). Differentiation and integration of trigonometric, exponential and logarithmic functions. Indeterminate forms and improper integrals. Techniques of integration. Application. Prerequisite: MATH 113 or 114, or equivalent. Note: This course may not be taken for credit if credit has already been obtained in either of MATH 101 or 118.

**MATH 117 Honors Calculus I**

★3 (*fi 6*) (first term, 4-0-0). Functions, continuity, and the derivative. Applications of the derivative. Integration and the Fundamental Theorem. Prerequisite: Mathematics 30 and 31 or their equivalents. Notes: This course is designed for students with at least a 75 percent grade in Mathematics 30. Other students may be admitted with the consent of the Department. This course may not be taken for credit if credit has already been obtained in any of MATH 100, 113, or 114.

**MATH 118 Honors Calculus II**

★3 (*fi 6*) (second term, 4-0-0). Techniques and applications of integration. Derivatives and integrals of the exponential, and trigonometric functions. Extended limits and l'Hospital's rule. Introduction to infinite series. Introduction to partial derivatives. Prerequisite: MATH 117 or its equivalent. Students with MATH 113 or 114 will be admitted with the consent of Department. Note: This course may not be taken for credit if credit has already been obtained in MATH 101 or 115.

**S** **MATH 120 Linear Algebra I**

★3 (*fi 6*) (either term, 3-0-0). Vector and matrix algebra, determinants, linear systems of equations, vector spaces, eigenvalues and eigenvectors and applications. Prerequisite: Mathematics 30 or equivalent. Note: This course may not be taken for credit if credit has already been obtained in MATH 127, 200 or 243.

**S** **MATH 121 Linear Algebra II**

★3 (*fi 6*) (either term, 3-0-0). Bases, linear transformations, change of bases, eigenvalues and eigenspaces, diagonalization, inner product, Gram Schmidt orthogonalization process, orthogonal diagonalization, quadratic form, applications. Prerequisites: MATH 120 or equivalent and Mathematics 31 or MATH 113 or MATH 114 or equivalent. Note: This course may not be taken for credit if credit has already been obtained in MATH 227.

**MATH 127 Honors Linear Algebra I**

★3 (*fi 6*) (first term, 3-0-0). Vectors, planes, and lines, linear transformation and matrices, systems of linear equations; vector spaces and subspaces, dimensions; determinants. Notes: This course is designed for students with at least an 80 percent grade in Mathematics 30. Other students may be admitted with the consent of the Department. This course may not be taken for credit if credit has already been obtained in either MATH 102 or 120. Prerequisite: Mathematics 30 and 31 or equivalent.

**MATH 128 Honors Algebra**

★3 (*fi 6*) (second term, 3-0-0). Relations, equivalence relations; groups, Lagrange's theorem; rings, fields, polynomials, finite fields. Elementary error-detecting and error-correcting codes. Note: This course may not be taken for credit if credit has already been obtained in MATH 223. Prerequisite: MATH 127.

**S** **MATH 153 Mathematics of Finance I**

★3 (*fi 6*) (either term, 3-0-0). Simple and compound interest, simple and general annuities certain; variable annuities and perpetuities, amortization schedules, sinking funds, applications. Prerequisite: Mathematics 30. Note: This course may not be taken for credit if credit has already been obtained in MATH 253.

**MATH 160 Higher Arithmetic**

★3 (*fi 6*) (either term, 3-0-0). Elementary Number Theory, Numeration Systems, Number Systems and Elementary Probability Theory. Prerequisite: MATH 30 or consent of Department. Note: This course is restricted to Elementary Education students.

**MATH 201 Differential Equations**

□3.5 (*fi 6*) (either term, 3-0-1). First-order equations; second-order linear equations: reduction of order, variation of parameters; Laplace transform; linear systems; power series; solution by series; separation of variables for PDEs. Prerequisite or corequisite: MATH 209 or 214. Notes: (1) Open only to Engineering students and Science students in the following programs:

Specialization Physics, Specialization Geophysics, Specialization Computing Science, or Specialization Geography (Meteorology). (2) This course may not be taken for credit if credit has already been obtained in any of MATH 205, 334, or 336. (3) Students in all sections of this course will write a common final examination. (★3)

**MATH 209 Calculus III**

□3.5 (*fi 6*) (either term, 3-0-1). Partial differentiation, derivatives of integrals. Multiple integration using rectangular, cylindrical, and spherical coordinates. Vector Field Theory. Prerequisite: MATH 101. Prerequisite or corequisite: MATH 102. Notes: (1) Students in all sections of this course will write a common final examination. (2) Restricted to Engineering students. (★3)

**MATH 214 Intermediate Calculus I**

★3 (*fi 6*) (either term, 3-0-0). Infinite Series. Plane curves and polar coordinates. Three dimensional analytic geometry. Partial derivatives. This course may not be taken for credit if credit has already been obtained in MATH 209 or MATH 217. Prerequisite: MATH 115 or equivalent.

**MATH 215 Intermediate Calculus II**

★3 (*fi 6*) (second term, 3-0-0). First order and second order linear differential equations with constant coefficients. Curves, tangent vectors, arc length, integration in two and three dimensions, polar cylindrical and spherical coordinates, line and surface integrals. Green's divergence and Stokes' theorems. Note: This course may not be taken for credit if credit has already been obtained in MATH 209 or 317. Prerequisite: MATH 214 or equivalent.

**MATH 216 Elementary Analysis**

★3 (*fi 6*) (either term, 3-0-0). Logic, techniques of proof, sets, functions, mathematical induction, real numbers, sequences, limits, continuity, derivatives, Riemann integral, infinite series. Note: This course is designed primarily for students who wish to enter the second year Honors Calculus sequences but have not taken MATH 117 and MATH 118. It may also be of interest to others who wish to see an elementary but rigorous introduction to calculus. Prerequisite: One of MATH 100, 113, 114 or 117.

**MATH 217 Honors Advanced Calculus I**

★3 (*fi 6*) (first term, 4-0-0). Axiomatic development of the real number system. Topology of  $\mathbb{R}^n$ . Sequences, limits and continuity. Multiple integration. Differential calculus; the chain rule. Note: This course is intended for second year Honors students in Mathematics and Physics. Other students admitted only with the consent of Department. Prerequisites: MATH 118 or MATH 115 and MATH 216. Corequisite: MATH 120 or 127.

**MATH 220 Linear Algebra III**

★3 (*fi 6*) (either term, 3-0-0). Diagonalization and triangulization of matrices, Jordan canonical form, application to differential equations, spectral theorem, quadratic forms, orthogonal operators. Prerequisite: MATH 121 or equivalent.

**MATH 223 Introduction to Abstract Algebra**

★3 (*fi 6*) (either term, 3-0-0). Properties of the integers, permutations, groups, Lagrange's theorem, factor groups, polynomials, rings, fields. Note: This course may not be taken for credit if credit has already been obtained in MATH 128. Prerequisite: MATH 120.

**MATH 227 Honors Linear Algebra II**

★3 (*fi 6*) (first term, 3-0-0). General vector spaces and linear transformations, similarity, eigenvalues, characteristic and minimal polynomials, diagonalization, Euclidean linear product and Gram-Schmidt orthogonalization, orthogonal and unitary operators, inner product spaces, diagonalization, normal operators, spectral theory. Prerequisite: MATH 127. Note: This course is intended for Honors programs. Other students admitted with the consent of the Department.

**MATH 241 Geometry I**

★3 (*fi 6*) (first term, 3-0-0). Basic Euclidean geometry, congruence, parallelism, area, and similarity. Sound axiomatic development with emphasis on problem solving. Constructions and loci, inequalities, maxima and minima, circles, isometries, and additional topics. Prerequisites: Any 100-level Mathematics course.

**MATH 242 Geometry II**

★3 (*fi 6*) (second term, 3-0-0). This course introduces Inversive and Projective Geometry in a very concrete way. It is treated as a new way to approach some of the problems of Euclidean Geometry. Prerequisite: MATH 241.

**MATH 253 Theory of Interest**

★3 (*fi 6*) (first term, 3-0-0). Accumulation and amount functions. Effective, simple, compound rates. Force of interest. Discount. Annuities certain, simple and general. Perpetuities. Amortization schedules and sinking funds. Bonds and other securities. Applications—valuation of securities, instalment loans, depreciation, depletion, capitalized cost. Prerequisite: MATH 115 or equivalent.

**MATH 254 Annuities and Life Insurance**

★3 (*fi 6*) (second term, 3-0-0). Elements of probability and application to life contingencies. Force of mortality. Construction of the mortality table. Types of life annuities and life insurance. Commutation functions. Net premiums. Prerequisites: MATH 115, 253, and one Statistics course such as STAT 141, 151, or 265, or MGTSC 301.

**MATH 260 Topics in Mathematics**

★3 (fi 6) (second term, 3-0-0). Problem solving in different areas of mathematics. Note: This course is intended for Elementary Education students and is not open to Science students. Prerequisite: MATH 160.

**MATH 262 Introduction to Discrete Mathematics**

★3 (fi 6) (first term, 3-0-0). Problem-solving techniques in discrete mathematics, covering topics such as: Elementary set theory, functions, relations. Induction. Permutations and combinations, inclusion-exclusion. Recurrence equations. Partitions and rankings. Elementary graph theory. Finite geometries, latin squares, and block designs. Prerequisite: Any 100-level Mathematics course.

**MATH 280 Numerical Methods I**

★3 (fi 6) (first term, 3-0-1). Calculus of finite differences, iterations. Methods of solving non-linear equations. Approximation of functions by Taylor series. Newton's Formulas, Lagrange, and Hermite Interpolation. Splines. Elementary methods for numerical evaluations of integrals and direct methods for solving linear systems of equations. Prerequisite: MATH 214 or equivalent, MATH 120 or equivalent. Note: Credit cannot be obtained for both MATH 280 and any of CMPUT 319, 340, or 358.

**MATH 300 Advanced Calculus I**

□3.0 (fi 6) (either term, 3-0-0). Review of ordinary differential equations. Boundary value problems, applications. Orthogonality, completeness and Fourier series. Solution of Laplace, heat and wave equations by Fourier series, transforms. Numerical methods. Prerequisite: MATH 201. Notes: (1) Open only to students in Engineering, Specialization Computing Science, Specialization Physics, and Specialization Geophysics. (2) This course may not be taken for credit if credit has already been obtained in MATH 337. (★3)

**MATH 309 Mathematical Methods for Electrical Engineers**

★3 (fi 6) (second term, 3-0-0). Complex numbers, analytic functions, Cauchy-Riemann equation, Cauchy Theorem, power series and Laurent expansions, residues, inverse Laplace transform. Complex inner product spaces, orthogonal expansions, Gram-Schmidt orthogonalization completeness, Fourier expansions applied signals, Parseval's relation and Bessel's inequality. Prerequisite MATH 209. This course may not be taken for credit if credit has already been obtained in MATH 311 or 411.

**MATH 311 Theory of Functions of a Complex Variable**

★3 (fi 6) (either term, 3-0-0). Complex numbers. Complex series. Functions of a complex variable. Cauchy's theorem and contour integration. Residue Theorem and its applications. Inverse Laplace transforms. Prerequisite or corequisite: MATH 201 or 215.

**MATH 314 Analysis I**

★3 (fi 6) (first term, 3-0-0). Construction of real numbers, Heine-Borel and related theorems, differentiation and Riemann integral of functions, topological concepts in metric spaces, sequences, continuous maps, contraction maps, and applications. Prerequisites: MATH 209, 215 or equivalent.

**MATH 317 Honors Advanced Calculus II**

★3 (fi 6) (second term, 4-0-0). Differential calculus, Taylor's formula, maxima and minima. Transformations of multiple integrals. Line integrals, theorems of Green, Gauss and Stokes. Sequences and Series. Uniform convergence. Improper integrals. Prerequisite: MATH 217.

**MATH 323 Applied Algebra I**

★3 (fi 6) (first term, 3-0-0). Boolean Algebra, switching circuits, graph theory, matrix representations; applications to economics, communication networks and social science. Prerequisites: Any 200-level Mathematics course and a single-term course in linear algebra.

**MATH 324 Elementary Number Theory**

★3 (fi 6) (first term, 3-0-0). Divisibility, prime numbers, congruences, quadratic residues, quadratic reciprocity, arithmetic functions and diophantine equations; sums of squares. Prerequisites: MATH 120, 223 (or 127, 128 and a 200-level Mathematics course).

**MATH 334 Introduction to Differential Equations**

★3 (fi 6) (either term, 3-0-0). First order equations, linear equations of higher order. Power series solution. Laplace transform methods. Introduction to special functions. Introduction to linear systems. Prerequisite: MATH 120 or 127. Corequisite: MATH 215 or 317. Note: This course may not be taken for credit if credit has already been obtained in MATH 201 or 336.

**MATH 336 Honors Differential Equations**

★3 (fi 6) (second term, 3-0-0). First order equations, second order equations. Systems of first order equations with constant coefficients, matrix differential equations, fundamental solutions, stability. Series solutions with a brief introduction to separation of variables, application to boundary value problems of mathematical physics. Elementary special functions. Elementary transform techniques. Prerequisite: MATH 118, MATH 217 or 214, MATH 227 or 121. Note: This course may not be taken for credit if credit has already been obtained in either of MATH 201 or 334.

**MATH 337 Introduction to Partial Differential Equations**

★3 (fi 6) (second term, 3-0-0). Boundary value problems of classical Math

Physics, orthogonal expansions, classical special functions. Advanced transform techniques. Note: This course may not be taken for credit if credit has already been obtained in either MATH 300 or equivalent. Prerequisite: MATH 334 or 336.

**MATH 340 Topics in Geometry**

★3 (fi 6) (first term, 3-0-0). A selection from constructability series, dissection theory, projective geometry, non-Euclidian geometry, finite geometrics, homogeneous coordinates, foundations of geometry, topology of two-manifolds. Prerequisite: MATH 241 or equivalent.

**MATH 347 Set Theory**

★3 (fi 6) (first term, 3-0-0). Axioms for set theory, transfinite induction, cardinal and ordinal numbers, applications. Primarily intended for third and fourth year students with a good background in mathematics. Prerequisite: Any 200-level Mathematics course.

**MATH 354 Actuarial Mathematics**

★3 (fi 6) (first term, 3-0-0). Net premium reserves, multiple life functions, multiple decrement models, valuation theory for pension plans, insurance models, nonforfeiture benefits, and dividends. Prerequisite: MATH 254. This course may be offered in alternate years.

**MATH 372 Mathematical Modelling I**

★3 (fi 6) (either term, 3-0-0). This course is designed to develop the students' problem-solving abilities along heuristic lines and to illustrate the processes of Applied Mathematics. Students will be encouraged to recognize and formulate problems in mathematical terms, solve the resulting mathematical problems and interpret the solution in real world terms. Typical problems considered include topics from population dynamics, mathematical ecology, mathematical economics, nonlinear programming, optimization problems, diffusion models. Prerequisite: MATH 120 and 215 or equivalent.

**MATH 373 Mathematical Programming and Optimization I**

★3 (fi 6) (first term, 3-0-0). Introduction to optimization. Problem formulation. Linear programming. The Simplex method and its variants (revised Simplex method, dual simplex method). Extreme points of polyhedral sets. Theory of linear inequalities (Farkas Lemma). Complementary slackness and duality. Post-optimality analysis. Interior point methods. Applications (elementary games, transportation problems, networks, etc.). Prerequisite: Any linear Algebra course and any 200-level Mathematics course.

**MATH 374 Mathematical Programming and Optimization II**

★3 (fi 6) (second term, 3-0-0). Maximizing and minimizing functions of several variables (with or without constraints). Optimality conditions (necessary, sufficient, Karush-Kuhn-Tucker conditions). Iterative methods for unconstrained optimization. Penalty methods for constrained optimization. Trust region methods. Convex sets, convex functions, convex programming and dual convex programs. Dynamic programming. Applications. Prerequisites: MATH 215 or 217 and MATH 373.

**MATH 380 Numerical Methods II**

★3 (fi 6) (second term, 3-0-1). Orthogonal polynomials and least squares approximations of functions. Iterative techniques for solving linear systems and calculation of eigenvalues and eigenvectors. Solution of non-linear systems, Newton's Methods and Steepest Descent Techniques, Numerical solution of initial value problems, Runge Kutta methods. Numerical solution of boundary value problems for ordinary differential equations and partial differential equations. Prerequisites: MATH 280. MATH 334 and an introductory course in Computing Science recommended.

**MATH 400 Industrial Internsh Practicum**

★3 (fi 6) (first term, 0-3s-0). Required by all students who have just completed a Mathematical Sciences Industrial Internship Program. Must be completed during the first academic term following return to full-time studies. Note: A grade of 1 to 9 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 experience of the Internship as demonstrated in an oral presentation. Prerequisite: WKEXP 953.

**MATH 411 Honors Complex Variable I**

★3 (fi 6) (first term, 3-0-0). Complex number system. Analytic functions. Single- and multi-valued functions, Cauchy's theorem and formula. Applications including the maximum modulus principle, Taylor's theorem and Laurent expansion. Harmonic functions. Dirichlet problem for the disk. Series of analytic functions. Calculus of residues. Idea of Analytic Continuation. Note: This course is primarily for Honors students in Mathematics or Physics. Offered in alternate years. It may be offered in intervening years if demand is sufficient. Prerequisite: MATH 314 or 317.

**MATH 414 Analysis II**

★3 (fi 6) (second term, 3-0-0). Differentiation of maps in  $R^n$ , implicit function and mapping theorems, sequences of functions, Riemann-Stieltjes integration, additional topics at the discretion of the instructor. Prerequisite: MATH 314.

**MATH 417 Honors Real Variables I**

★3 (fi 6) (first term, 3-0-0). Elements of set theory, cardinality, brief construction

of real numbers. Lebesgue measure and Lebesgue integral on the line. Differentiability, Riemann-Stieltjes integral and functions of bounded variation. Prerequisite: MATH 317 or equivalent.

#### **MATH 418 Honors Real Variables II**

★3 (*fi 6*) (second term, 3-0-0). Differentiation and integration. Elementary metric space theory. Banach space. Hilbert space. Baire Category.  $L^p$  spaces. Trigonometric series. Prerequisite: MATH 417.

#### **MATH 421 Introduction to Combinatorics**

★3 (*fi 6*) (second term, 3-0-0). An introduction to the methods and applications of discrete mathematics with topics to include: Enumeration; permutations and combinations, recurrence relations, generating series, the inclusion-exclusion principle. Graph theory; connectivity, matching, chromatic number, planar graphs, paths and cycles. Combinatorial designs; finite geometries, block designs. Applications. Prerequisites: MATH 128 (or 223) and a 300-level Mathematics course.

#### **MATH 423 Applied Algebra II**

★3 (*fi 6*) (second term, 3-0-0). Elements of group theory, cosets, Lagrange's theorem, binary group codes, polynomials, finite field theory, error correcting codes. Prerequisites: MATH 223 or 128, a linear algebra course and a 300-level Mathematics course.

#### **MATH 425 Elementary Field Theory**

★3 (*fi 6*) (second term, 3-0-0). Fields, Field extensions, ruler and compass constructions, the Galois group, topics for Galois theory, and algebraic number theory. Prerequisites: MATH 128 (or 223) and a 300-level Mathematics course.

#### **MATH 426 Honors Abstract Algebra I**

★3 (*fi 6*) (first term, 3-0-0). Groups, subgroups and normal subgroups, factor groups, homomorphisms, Sylow's theorems. Rings, ideals, quotient rings, homomorphisms, polynomial rings. Prerequisites: MATH 128 and a 300-level Mathematics course.

#### **MATH 427 Honors Abstract Algebra II**

★3 (*fi 6*) (second term, 3-0-0). Modules over a principal ideal domain, finitely generated abelian groups, canonical forms of matrices, fields of characteristic 0, Galois theory. Prerequisites: MATH 227 and MATH 426.

#### **MATH 432 Intermediate Differential Equations**

★3 (*fi 6*) (second term, 3-0-0). Elementary existence and uniqueness theorems. Systems of equations, stability, perturbation theory. Introduction to numerical methods. Introduction to phase plane analysis. Prerequisite: MATH 334 or 336.

#### **MATH 436 Intermediate Partial Differential Equations I**

★3 (*fi 6*) (first term, 3-0-0). Introduction to partial differential equations as physical models. Linear and quasilinear first-order equations. Classification of second order linear equations and reduction to canonical form. Characteristic surfaces and curves and shock formation. Formulation of initial and boundary-value problems. Stability theory and well-posedness. Introduction to spectral theory for positive self-adjoint operators on bounded domains. Finite Fourier Transforms. Duhamel's Principle. Eigenfunction expansion for nonlinear stability theory. Prerequisite: MATH 337.

#### **MATH 438 Intermediate Partial Differential Equations II**

★3 (*fi 6*) (second term, 3-0-0). Introduction to transforms; Fourier, Hankel, Laplace; asymptotic approximation of Fourier Integrals; applications to discontinuous solutions of the wave equation, point sources, fundamental solutions, Green's Functions, with an introduction to generalized functions. Eigenfunction expansions and applications. Difference equations. Prerequisite: MATH 436.

#### **MATH 446 Tensor Analysis**

★3 (*fi 6*) (first term, 3-0-0). Algebra of tensors, covariant differentiation in flat space, affine geometry, Riemannian geometry, Lie differentiation, subspaces, differential forms. Prerequisites: MATH 227 and 317.

#### **MATH 447 Elementary Topology**

★3 (*fi 6*) (second term, 3-0-0). Set Theory, metric spaces and general topology. Compactness, connectedness. Urysohn's Lemma and Tietze's Theorem. Baire Category Theorem. The Tychonoff Theorem. Homotopy and covering spaces. Primarily intended for third and fourth year students with a good background in Mathematics. Prerequisite: MATH 347 (or 217 and any 300-level Mathematics course). Offered in alternate years. It may be offered in intervening years if demand is sufficient.

#### **MATH 448 Elementary Differential Geometry I**

★3 (*fi 6*) (first term, 3-0-0). Local and global geometry of curves in 3-space; surfaces in 3-space: quadrics, surfaces of revolution, ruled surfaces, minimal surfaces, Gaussian curvature, theorema egregium, geodesics, complete surfaces, Gauss-Bonnet Theorem. Prerequisites: MATH 121 or 227, 217 and a 300-level Mathematics course. Offered in alternate years. It may be offered in intervening years if demand is sufficient.

#### **MATH 449 Elementary Differential Geometry II**

★3 (*fi 6*) (second term, 3-0-0). Manifolds, differentiable structures, differential systems. Frobenius theorem, linear connections, Riemannian manifolds, Lie

groups, applications in mathematics or physics. Prerequisites: MATH 317, 446, or 448, or consent of the Department.

#### **MATH 472 Mathematical Modelling II**

★3 (*fi 6*) (second term, 3-0-0). This course is a continuation of MATH 372. Problems discussed will be of a more advanced nature requiring a higher degree of mathematical sophistication. Prerequisite: MATH 372.

#### **MATH 486 Numerical Analysis**

★3 (*fi 6*) (first term, 3-0-0). Selection of topics will be at the instructor's option in consultation with the students, and may be chosen from the following: nonlinear equations, direct and iterative methods for linear systems, eigenvalue problems, approximating functions, differentiation and integration, and numerical solutions of differential equations. Prerequisites: MATH 227, 317 and an introductory course in Computing Science.

#### **MATH 496 Honors Seminar**

★3 (*fi 6*) (second term, 3-0-0). This course is intended to give students experience with independent reading, and to improve their ability to present and explain mathematical ideas. The course is compulsory for all fourth year Honors students in BSc and BA Mathematics and BSc Applied Mathematics. Prerequisite: MATH 317.

#### **MATH 497 Reading in Mathematics**

★3 (*fi 6*) (either term, 3-0-0). This course is designed to give credit to mature and able students for reading in areas not covered by courses, under the supervision of a staff member. A student, or group of students, wishing to use this course should find a staff member willing to supervise the proposed reading program. A detailed description of the material to be covered should be submitted to the Chair of the Department Honors Committee. (This should include a description of testing methods to be used.) The program will require the approval of both the Honors Committee, and the Chair of the Department. The students' mastery of the material of the course will be tested by a written or oral examination. This course may be taken in either term and may be taken any number of times, subject always to the approval mentioned above. Prerequisite: Any 300-level Mathematics course.

### 211.152.2 Graduate Courses

#### **MATH 506 Complex Variables**

★3 (*fi 6*) (either term, 3-0-0). Conformal mapping, normal families, Riemann mapping theorem and symmetry principle. Harmonic functions: basic properties. Maximum modulus principle with Phragmen-Lindelof and Hadamard 3 circle theorem. Entire functions, infinite products and Hadamard factorization. Riemann surfaces. Prerequisite: MATH 411.

#### **MATH 512 Algebraic Number Theory**

★3 (*fi 6*) (second term, 3-0-0). Valuations and their extensions, ramifications; integral dependence, algebraic number fields, ideals and divisors, class number. Prerequisite: MATH 427.

#### **MATH 515 Introduction to Mathematical Finance**

★3 (*fi 6*) (either term, 3-0-0). Discrete time price processes. Pricing and hedging. The binomial model. Elements of continuous time stochastic calculus. Log-normal price processes. The Black-Scholes formula. Hedging in continuous time. Martingale representation. American Options. Optimal stopping results. Term structure of interest rates. Applications of filtering, etc. Prerequisite: MATH 417 or consent of Department.

#### **MATH 516 Linear Analysis**

★3 (*fi 6*) (first term, 3-0-0). Banach spaces, Hahn-Banach theorem, Banach-Steinhaus theorem, Banach open mapping and closed graph theorems in Banach spaces. Hilbert spaces and orthonormal bases. Spectral theory of compact normal operators. Examples. Basic fixed point theorems and applications. Prerequisite: MATH 418 or consent of Department.

#### **MATH 517 Introduction to Functional Analysis**

★3 (*fi 6*) (first term, 3-0-0). Metric spaces. Completeness and compactness. Fixed points. Continuous operators and metric spaces. Linear and Non-linear spaces. Hilbert spaces. Linear operators and functionals. Approximate solutions of functional equations. Note: MATH 517 is not open to Honors or Graduate students of Mathematics. Prerequisite: MATH 414.

#### **MATH 518 Functional Analysis**

★3 (*fi 6*) (second term, 3-0-0). Locally convex spaces, weak topologies and duality in Banach spaces, weak compactness in Banach spaces, structure of classical Banach spaces, local structures, infinite-dimensional geometry of Banach spaces and applications. Prerequisite: MATH 516. Corequisite: MATH 447 or consent of Department.

#### **MATH 519 Introduction to Operator Algebras**

★3 (*fi 6*) (second term, 3-0-0). Banach algebras and spectral theory, compact and Fredholm operators, the spectral theorem for bounded normal operators, operator algebras, representations of  $C^*$ -algebras, elementary von Neumann algebra theory, and other topics. Prerequisite: MATH 516. Corequisite: MATH 447 or consent of Department.

**MATH 521 Differential Manifolds**

★3 (fi 6) (first term, 3-0-0). Finite dimensional manifolds/submanifolds; tangent bundle, differential, inverse, and implicit function theorems, partitions of unity; immersions, immersions, submersions; vector fields and associated flows; Lie derivative, Lie bracket; tensor analysis, differential forms, orientation, integration, Stokes' theorem; basics of smooth bundle theory, Riemannian metrics; notion of a Lie group with basic examples, smooth Lie group actions, principal bundles. Prerequisite: MATH 446 or 448.

**MATH 522 Differential Geometry**

★3 (fi 6) (either term, 3-0-0). Riemannian geometry: metrics, connections, geodesics, curvature, de Rham theorem. General theory of connections: principal bundles, linear and affine connections, holonomy groups. Lie transformation groups. Selected topics from: Singularities of maps, global analysis, G-structures, symmetric spaces, applications to partial differential equations, physics. Prerequisite: MATH 521.

**MATH 524 Ordinary Differential Equations IIA**

★3 (fi 6) (first term, 3-0-0). Existence theorems, uniqueness theorems; linear systems (basic theory); stability (basic theory); nonlinear systems (local theory); nonlinear systems (global theory); bifurcations. Prerequisite: MATH 334 or equivalent.

**MATH 525 Ordinary Differential Equations IIB**

★3 (fi 6) (second term, 3-0-0). Asymptotics; boundary value problems; Poincare-Bendixon theory. Additional material will be chosen from among the following topics at the option of the instructor: separation; dichotomies; comparison and oscillation theory; bifurcation theory; nonautonomous systems; dynamical systems; functional differential equations; contingent equations; differential equations in Banach spaces. Prerequisite: MATH 524 or equivalent.

**MATH 527 Intermediate Partial Differential Equations**

★3 (fi 6) (either term, 3-0-0). Notions; Elliptic P.D.E.'s; Parabolic P.D.E.'s; Hyperbolic P.D.E.'s; Nonlinear Integrable P.D.E.'s. Note: This course is intended primarily for students in Mathematics. It is more theoretically oriented than MATH 526. Prerequisite: MATH 436 or equivalent; Corequisite: MATH 518.

**MATH 529 Graph Theory**

★3 (fi 6) (either term, 3-0-0). Graphs, subgraphs, trees, connectivity, paths and cycles, matchings, chromatic number, independent sets and cliques, Ramsey Theory, planar graphs, directed graphs, algebraic graph theory. Prerequisites: MATH 421 and MATH 426.

**MATH 530 Algebraic Topology**

★3 (fi 6) (first term, 3-0-0). Particular background from point set topology (pasting and quotienting constructions); homotopy relation between maps and spaces; fundamental group; Seifert VanKampen theorem; covering spaces. Additional topics at the discretion of the instructor. Prerequisites: MATH 227, 317 and 447 or consent of Department. Corequisite: MATH 426.

**MATH 531 Algebraic Topology II**

★3 (fi 6) (second term, 3-0-0). Basics from homological algebra; (co)-homology; Lefschetz number, Euler characteristics, Lefschetz fixed point theorem (via singular theory and/or CW-theory and/or differential forms). Additional topics at the discretion of the instructor. Prerequisite: MATH 530 or consent of Department.

**MATH 532 General Topology I**

★3 (fi 6) (first term, 3-0-0). Elementary concepts of topology, nets and filters. Continuity homeomorphisms, product and quotient spaces. Axioms of separation and countability. Compactness, metrization, connectedness. Prerequisite: MATH 417 or 447.

**MATH 534 Introduction to the Theory of Approximation**

★3 (fi 6) (first term, 3-0-0). Polynomial interpolation, remainder formulae and error bounds. Best approximations in C, Lp and other norms. Degree of approximation by polynomials and trigonometric polynomials. Spline interpolation and approximation. Numerical differentiation, quadrature formulae and other applications to numerical analysis. Prerequisite: MATH 418.

**MATH 536 Numerical Solutions of Partial Differential Equations I**

★3 (fi 6) (first term, 3-0-0). Finite difference and finite element methods for boundary-value problems of elliptic equations. Numerical algorithms for large systems of linear algebraic equations: direct, classical relaxation, multigrid and preconditioned conjugate gradient methods. Algorithms for vector/parallel computers and the domain decomposition method. Prerequisites: MATH 337, 436 or equivalent and some computer programming.

**MATH 537 Numerical Solutions of Partial Differential Equations II**

★3 (fi 6) (second term, 3-0-0). Finite difference and finite element methods for parabolic and hyperbolic equations, initial-value and initial-boundary-value problems. Methods for linear/nonlinear scalar and systems of equations, singular equations. Convergence, stability analysis, and error estimate. Numerical dissipation and dispersion. Discontinuous solutions, shock and conservation laws. Prerequisites: MATH 337, 436 or equivalent, MATH 536 (recommended) and some computer programming.

**MATH 538 Techniques of Applied Mathematics**

★3 (fi 6) (either term, 3-0-0). Continuation of asymptotic expansion of integrals.

Perturbation theory, asymptotic matching, perturbative eigenvalue problems. Boundary layer theory. WKB theory. Prerequisite: MATH 438.

**MATH 542 Fourier Analysis**

★3 (fi 6) (either term, 3-0-0).  $L_2(T)$  theory, review and extension; orthonormal systems, Bessel's inequality, completeness, Parseval identity, Riesz-Fischer theorem. Fourier series in  $L_p(T)$  ( $1 \leq p < \infty$ ). Fejer means, conjugate series, Dirichlet, Fejer and Poisson kernels. Norm convergence, remarks on pointwise convergence. Fourier transforms in  $R^n$  and series in  $T^n$ : inverse transform, Plancherel formula, Poisson formula; Maximal functions, Riesz-Torin interpolation theorem and applications; Elementary distribution theory; D, D', S, S' and some elementary results; Fourier transform of tempered distributions. Examination of some earlier results with tempered distributions instead of functions and getting familiar with basic concepts. Prerequisite: MATH 418.

**MATH 550 Applications of Differential Geometry to Mechanics**

★6 (fi 12) (full session, 3-0-0). Configuration spaces as smooth manifolds, contangent bundles as phase spaces, vector fields on manifolds and tangent bundles, differential forms, integration. Review of variational calculus, Lagrangians, Hamiltonians, Legendre maps, symplectic and contact structures, Liouville theorem. Additional topics from Riemann and Finsler geometry, connections, dynamical systems with symmetry groups, Arnold's theory of Lagrangian singularities, ergodicity, geometric quantization. Prerequisite: MATH 446 or 448 or MA PH 443.

**MATH 555 Fluid Dynamics**

★6 (fi 12) (full session, 3-0-0). Fundamentals including stress tensor, invariants, stream functions; basic equations, equations relative to a rotating system, energy equation; general theorems for flow of an inviscid fluid including general results for rotating fluids; irrotational flows of an inviscid fluid of constant density including conformal mapping and the Joukowski airfoil; waves in an incompressible fluid including surface waves of small amplitude, nonlinear surface waves, internal waves in a continuously stratified fluid and inertial waves; dynamics of inviscid compressible fluids including shocks both normal and oblique, subsonic and supersonic flows; effects of viscosity including Darcy's law and Hele-Shaw cells; introduction to hydrodynamic stability and turbulence. Prerequisites: One of MATH 311, 407, 411, and MATH 436 or consent of Instructor.

**MATH 560 Optimization Techniques**

★3 (fi 6) (second term, 3-0-0). An advanced treatment of the theory and applications of modern techniques in optimization: dynamic programming, sequential techniques, duality, convexity, mathematical programming. Prerequisite: MATH 418 or MATH 414 or equivalent.

**MATH 581 Group Theory**

★3 (fi 6) (first term, 3-0-0). Sylow theory, free groups, soluble/nilpotent groups; Bilinera forms, classical groups; Character theory of finite groups. Prerequisite: Math 427.

**MATH 582 Rings and Modules**

★3 (fi 6) (second term, 3-0-0). Introduction to valuations; Free and projective modules, direct sums and products; Tensor products, central simple algebras; Aerin-Wedderburn theory; Commutative Noetherian rings including Nullstellensatz. Topics from homological algebra and category theory which may vary from year to year. Prerequisite: MATH 427 or consent of the Department.

**MATH 600 Reading in Mathematics**

★3 (fi 6) (either term, 3-0-0). Students registered in this course are supervised by individual staff members in areas of interest of the staff members. Students will be allowed to take this course only in exceptional circumstances and with the permission of the Chairman of the Department. This course shall not be counted against the minimum course requirement for graduate students.

**MATH 601 Morse Theory and Its Applications I**

★3 (fi 6) (either term, 3-0-0). Banach manifolds, tangent bundles, vector fields, semi-flows, implicit function theorem, submanifolds and transversity theorem. Riemannian manifold and Finsler structure. Deformation lemmas. Mountain Pass Theorem, Lusternik-Schnirelman theory. General Morse Lemma, critical groups and Morse inequalities, continuity of critical groups. Applications to Differential Equations and Boundary Value Problems. Prerequisites: MATH 518 and MATH 533 or consent of Department.

**MATH 617 Topics in Functional Analysis I**

★3 (fi 6) (first term, 3-0-0).

**MATH 618 Topics in Functional Analysis II**

★3 (fi 6) (second term, 3-0-0).

**MATH 627 Topics in Number Theory II**

★3 (fi 6) (second term, 3-0-0).

**MATH 630 Topics in Algebraic Topology**

★3 (fi 6) (either term, 3-0-0).

**MATH 638 Nonlinear Waves**

★3 (fi 6) (either term, 3-0-0).

**MATH 641 Banach Space Theory**

★3 (fi 6) (either term, 3-0-0). Prerequisite: MATH 519.

**MATH 642 Abstract Harmonic Analysis**

★3 (fi 6) (either term, 3-0-0). Prerequisite: MATH 519.

**MATH 643 Topics in Analysis**

★3 (fi 6) (either term, 3-0-0).

**MATH 650 Seminar in Algebra**

★1 (fi 2) (either term, 0-2s-0). Credit for this course may be obtained more than once.

**MATH 651 Seminar in Analysis**

★1 (fi 2) (either term, 0-2s-0). Credit for this course may be obtained more than once.

**MATH 652 Seminar in Differential Equations**

★1 (fi 2) (either term, 0-2s-0). Credit for this course may be obtained more than once.

**MATH 653 Seminar in Functional Analysis**

★1 (fi 2) (either term, 0-2s-0). Credit for this course may be obtained more than once.

**MATH 654 Seminar in Nonlinear Waves/Fluid Mechanics**

★1 (fi 2) (either term, 0-2s-0). Credit for this course may be obtained more than once.

**MATH 659 Research Seminar in Mathematics**

★1 (fi 2) (either term, 0-2s-0). Credit for this course may be obtained more than once.

**MATH 663 Topics in Applied Mathematics I**

★3 (fi 6) (first term, 3-0-0).

**MATH 664 Topics in Applied Mathematics II**

★3 (fi 6) (second term, 3-0-0).

**MATH 666 Topics in Mathematical Modelling**

★3 (fi 6) (either term, 3-0-0). Topics on standard mathematical methods used in modelling, selection at the option of the instructor. Various methodologies or philosophies of model building, techniques for simulation of dynamic systems and axiomatic approaches will be discussed. The course may be run in seminar fashion with an accent on reading current research literature and guest lectures from among the science faculty.

**MATH 667 Topics in Differential Equations I**

★3 (fi 6) (first term, 3-0-0).

**MATH 668 Topics in Differential Equations II**

★3 (fi 6) (second term, 3-0-0).

**MATH 676 Topics in Geometry I**

★3 (fi 6) (first term, 3-0-0).

**MATH 677 Topics in Geometry II**

★3 (fi 6) (second term, 3-0-0).

**MATH 678 Ring Theory I**

★3 (fi 6) (first term, 3-0-0).

**MATH 681 Topics in Algebra**

★3 (fi 6) (first term, 3-0-0).

**MATH 682 Topics in Algebra**

★3 (fi 6) (second term, 3-0-0).

**MATH 692 Topics in Group Theory**

★3 (fi 6) (first term, 3-0-0).

**MATH 693 Topics in Group Theory**

★3 (fi 6) (second term, 3-0-0).

**MATH 900 Directed Research Project**

★6 (fi 12) (variable).

**211.153 Mathématiques**

Faculté Saint-Jean

**MATHQ 113 Calcul élémentaire I**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-1). Revue de la géométrie analytique, différentiation et intégration des fonctions simples, applications. Prérequis: Mathématiques 30 ou l'équivalent. Les étudiants ayant complété Mathématiques 31 ne peuvent pas prendre ce cours. Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour MATH 100, 114, 117. Anciennement MATHQ 202.

**MATHQ 114 Calcul élémentaire I**

★3 (fi 6) (premier semestre, 3-0-0). Revue de la géométrie analytique. Différentiation et intégration des fonctions simples. Applications. Prérequis: Mathématique 30 et 31 ou l'équivalent. Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour MATH 100, 113, 117. Anciennement MATHQ 203.

**MATHQ 115 Calcul élémentaire II**

★3 (fi 6) (deuxième semestre, 3-0-0). Différentiation et intégration des fonctions trigonométriques, exponentielles et logarithmiques. Formes indéterminées et intégrales impropres. Techniques d'intégration. Applications. Prérequis: MATHQ 113, 114 ou l'équivalent. Anciennement MATHQ 204.

**MATHQ 120 Algèbre linéaire I**

★3 (fi 6) (premier semestre, 3-0-0). Vecteurs et algèbre matricielle. Déterminantes. Système d'équations linéaires. Espaces vectoriels. Valeurs propres et vecteurs propres. Applications. Prérequis: Mathématiques 30 ou l'équivalent. Remarque: ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour MATH 127, 200, 243. Anciennement MATHQ 221.

**MATHQ 121 Algèbre linéaire II**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Bases d'espaces vectoriels, transformations linéaires, changement de bases. Valeurs propres et espaces propres, diagonalisation. Produit scalaire. Procédé d'orthogonalisation de Gram-Schmidt, diagonalisation orthogonale. Forme quadratique. Applications. Prérequis: MATHQ 120 ou l'équivalent. Les cours de mathématique 30 et MATHQ 113 sont aussi recommandés. Remarque: ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour MATH 227. Anciennement MATHQ 222.

**MATHQ 214 Calcul intermédiaire I**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Séries infinies. Courbes planes et coordonnées polaires. Vecteurs et géométrie analytique à trois dimensions. Dérivées partielles. Prérequis: MATHQ 115 ou l'équivalent. Remarque: ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour MATH 209 ou 217. Anciennement MATHQ 302.

**MATHQ 215 Calcul intermédiaire II**

★3 (fi 6) (l'un ou l'autre semestre, 3-0-0). Equations différentielles linéaires de premier et de second ordre avec coefficients constants. Courbes, vecteurs, tangentes, longueur de l'arc, intégration en deux et trois dimensions, coordonnées polaires, cylindriques et sphériques, intégrale de ligne et de surface, théorème de Green. Divergence et théorème de Stokes. Prérequis: MATHQ 214. Note: Ce cours n'est pas accessible aux étudiants ayant ou postulant des crédits pour MATH 209, 308, ou 317. Anciennement MATHQ 303.

**211.154 Mechanical Engineering**Department of Mechanical Engineering  
Faculty of Engineering

The following table lists renumbered courses effective 1993/94:

Old	New	Old	New
MEC E 350	MEC E 250	MEC E 482	MEC E 380
MEC E 361	MEC E 260	MEC E 491	MEC E 390
MEC E 400	MEC E 300	MEC E 501	MEC E 402
MEC E 401	MEC E 301	MEC E 509	MEC E 409
MEC E 403	MEC E 303	MEC E 532	MEC E 430
MEC E 464	MEC E 364	MEC E 550	MEC E 451
MEC E 413	MEC E 310	MEC E 561	MEC E 460
MEC E 431	MEC E 330	MEC E 562	MEC E 463
MEC E 440	MEC E 340	MEC E 569	MEC E 469
MEC E 450	MEC E 351	MEC E 571	MEC E 470
MEC E 461	MEC E 362	MEC E 584	MEC E 480
MEC E 462	MEC E 360		

The following table lists renumbered courses effective 1994/95:

Old	New	Old	New
MEC E 610	ENG M 620	MEC E 612	ENG M 640
MEC E 611	ENG M 630	MEC E 613	ENG M 650

The following table lists renumbered courses effective 1996/97:

Old	New	Old	New
MEC E 512	MEC E 412	MEC E 718	MEC E 670
MEC E 543	MEC E 443	MEC C 719	MEC E 680

**211.154.1 Undergraduate Courses****MEC E 200 Introduction to Mechanical Engineering**

□1.0 (fi 2) (second term, 0-2-0). Introduction to the profession of mechanical engineering with special emphasis of industries in Alberta. Selected guest speakers on design problems in mechanical engineering. Communication skills including written and oral presentations. (★1)

**MEC E 250 Engineering Mechanics II**

□3.5 (fi 6) (either term, 3-1s-0). Moments of inertia. Kinematics and kinetics of rigid body motion, energy and momentum methods, impact, mechanical vibrations. Prerequisites: ENGG 130, EN PH 131 and MATH 101. There is a consolidated exam. (★3)

**MEC E 260 Mechanical Design I**

□3.5 (fi 6) (second term, 2-0-3). Design morphology, analysis and design of

components, computer-aided design introduction, design project. Prerequisites: CIV E 270, MEC E 265. (★3)

#### **MEC E 265 Engineering Graphics and CAD**

□3.5 (*fi 6*) (first term, 2-0-3). Engineering drawing and sketching, conventional drafting, computer-aided drawing in 2D and 3D, solid modelling, and computer-aided design. Prerequisite: ENCMP 100. (★3)

#### **MEC E 300 Mechanical Measurements**

□3.0 (*fi 6*) (either term, 3-0-0). Characterization and behavior of measuring systems. Statistics and analysis of measurement data; measurement techniques applied to fundamental mechanical engineering phenomena. Prerequisites: CIV E 270, E E 239, STAT 235. Corequisite: MEC E 330. (★3)

#### **MEC E 301 Mechanical Engineering Laboratory**

□2.5 (*fi 6*) (either term, 1-0-3). Laboratory experiments in mechanical engineering measurement techniques, treatment of measurement data, introduction to engineering report writing. Corequisite: MEC E 300. (★3)

#### **MEC E 303 Mechanical Engineering Laboratory I**

□2.5 (*fi 6*) (either term, 1-0-3). Selected laboratory experiments in applied mechanics and thermosciences. Prerequisites: MEC E 300, 301. (★3)

#### **MEC E 310 Engineering Economy**

□3.0 (*fi 6*) (either term, 3-0-0). The application of the fundamentals of economics to engineering alternatives in planning, developing and managing industrial projects. (★3)

#### **MEC E 330 Fluid Mechanics**

□3.5 (*fi 6*) (either term, 3-0-1). Basic equations, hydrostatics, Bernoulli equation, momentum theories, similitude, fluid metering, fluid friction in pipes, external flow, boundary layers. Prerequisites: MEC E 250, MATH 209. Corequisite: CH E 243. (★3)

#### **MEC E 340 Applied Thermodynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Review of the fundamentals of thermodynamics. Cycle analysis and application to gas compressors, gas and steam turbines, and refrigeration, availability analysis, principles of combustion, psychrometry. Prerequisite: CH E 243. (★3)

#### **MEC E 351 Vector Dynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Kinematics of rigid bodies in three dimensions. Moments of inertia, equations of motion for a body, engineering applications. Prerequisite: MEC E 250. (★3)

#### **MEC E 360 Mechanical Design II**

□3.8 (*fi 6*) (either term, 3-0-3/2). Design procedures, theories of failure, material selection, design for fatigue, creep and relaxation, selection of gears and bearings, development and application of computer-aided design software. Prerequisite: MEC E 260. (★3)

#### **MEC E 362 Mechanics of Machines**

□3.8 (*fi 6*) (either term, 3-0-3/2). Velocities and acceleration in plane mechanisms, balancing of rotating and reciprocating machinery, gears and gear trains. Prerequisite: MEC E 250. (★3)

#### **MEC E 364 Manufacturing Processes**

□2.8 (*fi 6*) (either term, 2-0-3/2). Primary and secondary processes in metal forming, material removal and fabrication techniques, selected field trips and laboratory and shop exercises. Prerequisite: MEC E 260. (★3)

#### **MEC E 380 Advanced Strength of Materials I**

□3.0 (*fi 6*) (either term, 3-0-0). Review of stress, strain, stress-strain relation, time-independent and time-dependent behavior, virtual work and energy theorems, deformations, indeterminate systems, matrix methods. Prerequisite: MEC E 260. (★3)

#### **MEC E 390 Computer-Aided Engineering I**

□3.5 (*fi 6*) (either term, 3-0-1). Application of numerical methods to mechanical engineering problems; topics include roots of algebraic and transcendental equations, simultaneous equations, curve fitting and interpolation, numerical integration and differentiation, numerical integration of ordinary differential equations. Prerequisites: MATH 102, 201, ENCMP 100 (or equivalent). (★3)

#### **MEC E 402 Engineering Design**

□2.0 (*fi 4*) (first term, 2-0-0). Oral presentation and report writing techniques. Presentations by students and selected guest lecturers on design problems in engineering. (★2)

#### **MEC E 409 Experimental Design Project I**

□2.5 (*fi 6*) (either term, 1-0-3). Selected group projects in experimental measurement and mechanical design. Two to four person groups develop planning, design, testing and report writing skills on projects in applied mechanics, thermosciences and engineering management. Prerequisites: MEC E 303 and MEC E 310. (★3)

#### **MEC E 412 Total Quality Management**

□3.5 (*fi 6*) (either term, 3-0-1). Quality and their applications in design and operations. Concept and philosophy of quality. Ideas of Deming, Juran, Feigenbaum, Ishikawa, and Taguchi. Quality systems including ISO 9000.

Creation of quality including the new Japanese tools, QFD, FMEA, fault trees and value analysis. Statistical process control. Application of Total Quality Management philosophy. Prerequisites: MEC E 310 and STAT 235 or equivalent. (★3)

#### **MEC E 430 Compressible Flow**

□3.0 (*fi 6*) (first term, 3-0-0). One dimensional flow in pipes and varying area-nozzles, normal shock waves, flow in constant area pipes with friction and heat addition, methods of measurement in compressible flow, behavior of real, non-ideal gases and two phase flow, flow transients. Prerequisite: MEC E 330. (★3)

#### **MEC E 443 Energy Conversion**

□3.0 (*fi 6*) (either term, 3-0-0). Sources, flow and overall efficiency of use of various energy forms in society, thermodynamic analysis of energy conversion devices such as thermoelectric and magnetohydrodynamic generators, solar and fuel cells, energy from fission and fusion reactors. Prerequisite: MEC E 340. (★3)

#### **MEC E 451 Vibrations and Sound**

□3.5 (*fi 6*) (first term, 3-0-1). Free and forced vibration of single degree of freedom systems with and without damping, vibration isolation, free vibration of multi degrees of freedom systems, vibration absorption, beam vibrations, sound waves, sound sources, subjective aspects of noise. Prerequisites: MEC E 250 and MATH 300. (★3)

#### **MEC E 463 Thermo-Fluid Systems Design**

□4.0 (*fi 6*) (second term, 3-0-2). Design and optimization of thermo-fluid systems, heating and ventilation equipment and load calculations, system design, piping networks, heat exchanger analysis and design, computer-aided design projects. Prerequisite: MEC E 470. (★3)

#### **MEC E 465 Design Project**

□6.0 (*fi 12*) (full session, 1-0-4). Feasibility study and detailed design of a project which requires students to exercise creative ability, to make assumptions and decisions based on synthesis of technical knowledge, and in general, devise new designs, rather than analyse existing ones. Prerequisites: MEC E 310, 360; corequisites: MEC E 470, 480. (★6)

#### **MEC E 469 Experimental Design Project II**

□2.5 (*fi 5*) (either term, 1-0-3). Advanced project in experimental measurement and mechanical designs in applied mechanics, thermosciences and engineering management. Prerequisite: MEC E 409. (★2.5)

#### **MEC E 470 Heat Transfer**

□3.5 (*fi 6*) (first term, 3-1s-0). Mechanisms of heat transfer, steady and unsteady heat conduction, numerical analysis, thermal radiation, free and forced convection, heat exchanger analysis and heat transfer with change of phase. Prerequisites: MATH 300, MEC E 330 and 340. Corequisite: MEC E 390. (★3)

#### **MEC E 480 Advanced Strength of Materials**

□3.0 (*fi 6*) (first term, 3-0-0). Special topics for beams, torsion, pressure vessels, plane stress and strain, stability, fracture mechanics. Prerequisites: MEC E 360, 380, MATH 300. (★3)

## 211.154.2 Graduate Courses

**Note:** The courses ENG M 620, MEC E 630, 640, 670, 680 and 681 normally will be offered annually. Other courses will be offered on a lecture basis when there is sufficient enrolment; otherwise they will be offered on a guided reading basis.

#### **MEC E 513 Production and Operations Management**

□3.0 (*fi 6*) (either term, 3-0-0). Production and operations management, analysis, and design of work, forecasting, inventory management including MRP, JIT, and Kanban, maintenance management, facility layout, operations scheduling, and project planning and management. Prerequisites: MEC E 310 and STAT 235 or equivalent. (★3)

#### **MEC E 514 Reliability and Maintainability**

□3.0 (*fi 6*) (either term, 3-0-0). The study of reliability in engineering design, definitions of reliability, maintainability, hazard functions, failure rates, frequently used probability distributions, the economics of reliability and maintenance, single and multiple component systems. Prerequisite: STAT 235. (★3)

#### **MEC E 523 Principles of Heating and Air Conditioning**

□3.5 (*fi 6*) (either term, 3-1s-0). The characteristics of heating, cooling, refrigeration and heat pump systems, performance of system components, energy management, and energy conservation, solar energy systems. Prerequisites: MEC E 330 and 340. (★3)

#### **MEC E 535 Inhalation Aerosols and their Applications in Medicine**

□3.0 (*fi 6*) (either term, 3-0-0). Overview of the mechanical principles involved in delivering aerosols to the lung for treatment of disease. Factors affecting deposition of aerosols in the lung, experimental measurement of aerosol properties, fluid dynamics in the lung, methods of producing aerosols for inhalation, theoretical models for predicting human lung deposition. Prerequisites: MEC E 330 or equivalent or consent of instructor. (★3)

**MEC E 537 Aerodynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Boundary layer flow, vorticity, circulation and aerodynamic lift, wing theory, aeronautical applications. Prerequisite: MEC E 300. (★3)

**MEC 539 Applied Computational Fluid Dynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Grid generation, time-marching methods, control volume formulations, shock capture, artificial dissipation, upwind flux-limiting, space-marching multigrid acceleration. Hands-on experience with commercial CFD codes to illustrate practical implementations and performance of theory. Prerequisites: MEC E 390, and 330 or equivalent. (★3)

**MEC E 541 Combustion Engines**

□3.0 (*fi 6*) (either term, 3-0-0). History of basic cycles, combustion theory including ignition flame propagation and engine knock, cycle analysis with deviations from ideal cycles and performance characteristics, fuels, design and operation of carburation and injection processes, exhaust emissions measurements. Identification of design parameters and their effect on emissions. Prerequisite: MEC E 340. (★3)

**MEC E 542 Multiphase Flow and Heat Transfer for Energy and Environmental Technologies**

□3.0 (*fi 6*) (either term, 3-0-0). Multiphase flow and transport phenomena, widespread occurrence and the design problems that arise, the central role of flow patterns and transition phenomena. Transport, heat transfer and separation processes of gas-liquid-solid systems are presented using recent research and development projects applied to enhanced oil production, energy recovery and environmental problems. Prerequisite: MEC E 330 or equivalent. (★3)

**MEC E 553 Acoustics and Noise Control**

□3.0 (*fi 6*) (either term, 3-0-0). Acoustic waves, sound transmission through walls and structures, acoustics of large and small rooms, mechanisms of sound absorption. Design of silencers. Prerequisites: MEC E 330 and 451. (★3)

**MEC E 555 Introduction to Robotics**

□3.0 (*fi 6*) (either term, 3-0-0). History and description of industrial robot applications, kinematics of industrial manipulators, actuators and servomechanisms, gripper design, motion planning, programming and simulation, work cell design, social implications. Prerequisites: MEC E 250 and MATH 102 or equivalent. (★3)

**MEC E 563 Computer-Aided Engineering II**

□3.0 (*fi 6*) (either term, 3-0-0). Application of finite element methods to the analysis of rods, beams, trusses, frames, plane problems in elasticity, fluid mechanics, heat transfer and lubrication. The design of machine components using finite element programs. Prerequisites: MATH 300, MEC E 360, 390 (or equivalents). (★3)

**MEC E 565 Environmental Factors in Mechanical Design**

□3.0 (*fi 6*) (either term, 3-0-0). Source inventories and regulatory standards for biological effects of pollutants, atmospheric dispersion models, stack design, analysis of source control of particulate and combustion product emissions, probability theory for risk analysis, and toxic release hazard assessments. Prerequisite: CH E 243. Corequisite: MEC E 330. (★3)

**MEC E 601 Graduate Seminar**

□0.5 (*fi 1*) (either term, 0-1s-0). Presentations by Master's graduate students, staff, and visiting scientists on current research topics. (★0.5)

**MEC E 602 Graduate Seminar**

□0.5 (*fi 1*) (either term, 0-1s-0). Presentations by PhD graduate students on current research projects. (★0.5)

**MEC E 605 Experimental Strain Analysis**

□3.0 (*fi 6*) (either term, 3-0-0). Basic experimental methods used in engineering mechanics, including photoelasticity, strain gauges, brittle coatings; measurement in static, dynamic and transient system, ultrasonics; laboratory exercises. (★3)

**MEC E 620 Combustion**

□3.0 (*fi 6*) (either term, 3-0-0). Chemical reactions, chemical equilibrium and flame temperatures. Flame propagation and explosion theories. Detonations. Air pollution from combustion sources. (★3)

**MEC E 630 Fluid Dynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Kinematics of fluid motion, fundamental fluid equations and concepts, laminar boundary layers, potential flow, stability and transition, introduction to turbulence. (★3)

**MEC E 632 Turbulent Fluid Dynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Governing equations of turbulent flow. Statistical and phenomenological theories of turbulent transport of momentum, heat and mass in wall-bounded and free flows. Computational techniques, empirical data and applications. (★3)

**MEC E 638 Vortex Flows**

□3.0 (*fi 6*) (either term, 3-0-0). Vortex dynamics approach to large-scale

structures in turbulent flows. Vortex motion equations, conservation laws, and modelling using discrete vortices. Prerequisite: a senior undergraduate course in fluid mechanics or consent of Instructor. (★3)

**MEC E 639 Computational Fluid Dynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Computational fluid dynamics methods for incompressible and compressible fluids. Application to aeronautical and internal flows, finite difference, finite volume, and spectral methods. Prerequisite: CH E 674 or equivalent or consent of Instructor. (★3)

**MEC E 640 Analytical Thermodynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Extension of classical thermodynamics, statistical thermodynamics applied to engineering systems. Irreversible thermodynamics, thermoelectricity and thermodiffusion. (★3)

**MEC E 650 Analytical Dynamics**

□3.0 (*fi 6*) (either term, 3-0-0). Principle of virtual work; Lagrange's equations of motion for holonomic and non-holonomic systems; Hamilton's principle; application to gyroscopes, stabilizers, etc. (★3)

**MEC E 652 Nonlinear Oscillations**

□3.0 (*fi 6*) (either term, 3-0-0). Phase plane, singular points, non-linear conservative systems, limit cycles, stability, perturbation method, non-linear resonance. (★3)

**MEC E 653 Signal Processing of Time and Spectral Series**

□3.0 (*fi 6*) (either term, 3-0-0). Practical application of processing techniques to the measurement, filtering and analysis of mechanical system signals; topics include: signal classification, A/D conversion, spectral analysis, digital filtering and real-time signal processing. (★3)

**MEC E 655 Dynamics of Structures**

□3.0 (*fi 6*) (either term, 3-0-0). Behavior of elastic structures subjected to dynamic loads. Vibrations of buildings and bridges excited by machinery, earthquakes, wind and traffic. (★3)

**MEC E 663 Discrete Element Analysis of Mechanical Systems**

□3.0 (*fi 6*) (either term, 3-0-0). Applications of matrix methods, finite element and boundary element techniques to problems in applied mechanics. Emphasis on the use of micro-computers. (★3)

**MEC E 665 Pressure Vessel Design**

□3.0 (*fi 6*) (either term, 3-0-0). This course offers an integrated treatment of stress analysis, design theory, material behavior and construction of pressure vessels used in the energy, chemical and petroleum industries. Special topics covered include the basis of the ASME code, stresses in shells and heads, discontinuity stresses arising from openings and attachments, and design of welded joints. Prerequisite: MEC E 480 or consent of Instructor. (★3)

**MEC E 670 Advanced Heat Transfer**

□3.0 (*fi 6*) (second term, 3-0-0). Advanced topics in conduction and convection heat transfer; solution by analytical and numerical methods. (★3)

**MEC E 680 Continuum Mechanics**

□3.0 (*fi 6*) (either term, 3-0-0). Introduction to cartesian tensor algebra and calculus; analysis of finite deformation and kinematics of motion; transport theorems and balance laws; analysis of stress; continuum thermodynamics, constitutive equations and material symmetry with application to solids and fluids. (★3)

**MEC E 681 Elasticity**

□3.0 (*fi 6*) (either term, 3-0-0). Extension, torsion and flexure of beams; two-dimensional problems; complex variable methods; integral transform methods; variational methods. (★3)

**MEC E 682 Plasticity**

□3.0 (*fi 6*) (either term, 3-0-0). Yield condition, plastic potential, elastic-plastic problems, characteristic theory, slip line fields, plane stress anisotropy. (★3)

**MEC E 683 Plates and Shells**

□3.0 (*fi 6*) (either term, 3-0-0). Solutions of the plate equation for rectangular and circular plates with various boundary conditions; special and approximate methods; membrane theory of shells; bending theory of cylindrical shells. (★3)

**MEC E 684 Static and Dynamic Stability**

□3.0 (*fi 6*) (either term, 3-0-0). Classical stability analysis of bars and plates subjected to various loading conditions. Energy methods. Dynamic stability of non-conservative force systems and the effects of internal friction. Inelastic buckling, torsional buckling. (★3)

**MEC E 685 Macro Fracture Mechanics**

□3.0 (*fi 6*) (either term, 3-0-0). Basic concepts of linear and nonlinear fracture mechanics: linear and nonlinear stationary crack-tip stress, strain and displacement fields; energy balance and energy release rates; fracture resistance concepts-static and dynamic fracture toughness; criteria for crack growth; fracture control methodology and applications. (★3)

**MEC E 686 Fatigue of Engineering Materials**

□3.0 (*fi 6*) (either term, 3-0-0). A study of mechanisms and mechanics of

fatigue process; damage caused by constant and variable cyclic amplitudes and random loading; effects of load interaction; initiation and propagation of fatigue cracks; life prediction; effects of multiaxial stress states, temperature and environment. (★3)

#### MEC E 690 Analytical Techniques in Engineering

□3.0 (*fi 6*) (either term, 3-0-0). Application of mathematical techniques to the solution of ordinary and partial differential equations arising in engineering problems. In particular, separation of variables, method of characteristics, transform methods, solution by complex variables, and variational methods will be considered. Prerequisite: MATH 300 or equivalent. (★3)

#### MEC E 728 Advanced Topics in Applied Thermodynamics I

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MEC E 729 Advanced Topics in Applied Thermodynamics II

□3.0 (*fi 6*) (either term, 3-0-0). Combustion, refrigeration. (★3)

#### MEC E 738 Advanced Topics in Fluid Dynamics I

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MEC E 739 Advanced Topics in Fluid Dynamics II

□3.0 (*fi 6*) (either term, 3-0-0). Aerodynamics, rarefied gas dynamics, turbulence, hydro and thermo stability. (★3)

#### MEC E 748 Advanced Topics in Thermodynamics I

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MEC E 749 Advanced Topics in Thermodynamics II

□3.0 (*fi 6*) (either term, 3-0-0). Energy conversion, general thermodynamics, irreversible thermodynamics. (★3)

#### MEC E 758 Advanced Topics in Dynamics I

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MEC E 759 Advanced Topics in Dynamics II

□3.0 (*fi 6*) (either term, 3-0-0). Wave propagation, orbital dynamics. (★3)

#### MEC E 778 Advanced Topics in Heat Transfer I

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MEC E 779 Advanced Topics in Heat Transfer II

□3.0 (*fi 6*) (either term, 3-0-0). Conduction, convection, radiation. (★3)

#### MEC E 788 Advanced Topics in Solid Mechanics I

□3.0 (*fi 6*) (either term, 3-0-0). (★3)

#### MEC E 789 Advanced Topics in Solid Mechanics II

□3.0 (*fi 6*) (either term, 3-0-0). Elasticity plasticity, viscoelasticity, shells. (★3)

#### MEC E 900 Directed Research Project

★6 (*fi 12*) (variable). Detailed Engineering report in the student's major area of interest.

## 211.155 Medical Laboratory Science

Division of Medical Laboratory Science  
Faculty of Medicine and Oral Health Sciences

### Notes

- (1) See also INT D 409 and 491 for courses which are offered by more than one department or Faculty and which may be taken as options or as a course in this discipline.
- (2) MLSCI 320, 330, 340, 350, 360, and 370 are to be taken as a unit over a 42-week period. They are open to students of Medical Laboratory Science only or by special permission of the Division.

#### MLSCI 230 Hematology

★3 (*fi 6*) (first term, 3-0-6). An introduction to the theory and practise of hematology, this course will include the morphology, structure, and function of red cells, white cells, and platelets, malignant and benign conditions that affect each cell type, and tests to distinguish among disease states including anemia and leukaemia. Restricted to Medical Laboratory Science students.

#### MLSCI 231 Hematology

★3 (*fi 6*) (first term, 3-0-0). This course is designed for students who are excused from the laboratory component of the normal MLSCI course. An introduction to the theory and practise of hematology, this course will include the morphology, structure, and function of red cells, white cells, and platelets, malignant and benign conditions that affect each cell type, and tests to distinguish among disease states including anemia and leukaemia. Prerequisite: RT (CSLT) certification or consent of Department. Credit granted for only one of MLSCI 230 or 231.

#### MLSCI 235 Hemostasis

★1 (*fi 2*) (second term, 3-0-6). Four weeks. This course will present the theory and practice of hemostasis. Topics include the vascular, platelet, clotting factor, fibrinolytic, and inhibitor systems: coagulation disorders; tests that identify factor deficiencies, monitor anticoagulant therapy, and assess

thrombolytic states; disorders of hemostasis. Prerequisite: MLSCI 230 or consent of Department. Restricted to Medical Laboratory Science students.

#### MLSCI 236 Hemostasis

★1 (*fi 2*) (second term, 3-0-0). Four weeks. This course is designed for students who are excused from the laboratory component of the normal MLSCI course. This course will present the theory and practice of hemostasis. Topics include the vascular, platelet, clotting factor, fibrinolytic and inhibitor systems: coagulation disorders; tests that identify factor deficiencies, monitor anticoagulant therapy, and assess thrombolytic states; disorders of hemostasis. Prerequisite: MLSCI 230 or consent of Department. Restricted to Medical Laboratory Science students.

#### MLSCI 250 Human Histology and Histotechnology

★3 (*fi 6*) (either term, 3-0-4). This course is primarily designed to provide an understanding of human histology and of the techniques used in its study. It will also include, in part, basic pathology (including the nature of malignant disease) and the application of histological and histochemical techniques to demonstrate the diagnostic features of human disease processes. The goal of the course is for students to understand the structure and functions of the cell, and the components and functions of organ systems. The course will also teach students to recognize human tissues at the light and electron microscopical levels. Lectures will be used to illustrate basic principles, and the ability to recognize tissues and organ systems will be acquired in the laboratory. Students will be expected to acquire a detailed knowledge of the subject both from a theoretical and practical level. Restricted to Medical Laboratory Science students or consent of Department.

#### MLSCI 262 Clinical Biochemistry

★3 (*fi 6*) (first term, 3-0-3). This course considers how the analysis of samples from the body for various constituents can give insight into pathological processes. Included are the principles for tests routinely carried out in a clinical biochemistry laboratory, and the biological understanding of test results. Specific subjects considered are carbohydrates, renal function, blood proteins and electrolytes, and acid-base balance. Restricted to Medical Laboratory Science students.

#### MLSCI 263 Clinical Biochemistry

★3 (*fi 6*) (second term, 3-0-3). This course considers how the analysis of samples from the body for various constituents can give insight into pathological processes. Included are the principles for tests routinely carried out in a clinical biochemistry laboratory, and the biological understanding of test results. Specific subjects considered are clinical enzymology, heme catabolism, liver function toxicology and therapeutic drug monitoring principles of immunoassays, blood lipids porphyrins, endocrinology, gastric and GI function, fetal-placental function, and biochemical tumor markers. Restricted to Medical Laboratory Science students.

#### MLSCI 264 Clinical Biochemistry

★3 (*fi 6*) (first term, 3-0-0). This course considers how the analysis of samples from the body for various constituents can give insight into pathological processes. Included are the principles for tests routinely carried out in a clinical biochemistry laboratory, and the biological understanding of test results. Specific subjects considered are carbohydrates, renal function, blood proteins and electrolytes, and acid-base balance. Prerequisites for non-Medical Laboratory Science students only: CHEM 101, 161, 163 and BIOL 107. Credit granted for only one of MLSCI 262 or 264.

#### MLSCI 265 Clinical Biochemistry

★3 (*fi 6*) (second term, 3-0-0). This course considers how the analysis of samples from the body for various constituents can give insight into pathological processes. Included are the principles for tests routinely carried out in a clinical biochemistry laboratory, and the biological understanding of test results. Specific subjects considered are clinical enzymology, heme catabolism, liver function, toxicology and therapeutic drug monitoring, principles of immunoassays, blood lipids, porphyrins, endocrinology, gastric and GI function, fetal-placental function, and biochemical tumor markers. Prerequisites for non-Medical Laboratory Science students only: MLSCI 264. Credit granted for only one of MLSCI 263 or 265.

#### MLSCI 270 Transfusion Science

★2 (*fi 4*) (second term, 3-0-6). Nine weeks. This course will present the theory and practice of transfusion science. Topics covered include the genetics of blood groups pretransfusion testing, blood donation and component therapy, adverse effects of transfusion, hemolytic disease of the newborn, and autoimmune hemolytic anemia Prerequisite: MLSCI 230 or consent of Department. Restricted to Medical Laboratory Science students.

#### MLSCI 271 Transfusion Science

★2 (*fi 4*) (second term, 3-0-0). Nine weeks. This course is designed for students who are excused from the laboratory component of the normal MLSCI course. This course will present the theory and practice of transfusion science. Topics covered include the genetics of blood groups, or pretransfusion testing, blood donation and component therapy, adverse effects of transfusion, hemolytic disease of the newborn, and autoimmune hemolytic anemia. Prerequisite; MLSCI 230 or consent of Department. Restricted to Medical Laboratory Science students.

**MLSCI 320 Analysis and Communication of Biomedical Information**

★3 (fi 6) (full session, 1-0-2). Lectures, seminars, and assignments address the following components of writing a literature review: library searches, critical analysis, organizing, writing and editing. Speaking skills are developed through oral presentation of case studies. Prerequisite: consent of Division.

**MLSCI 330 Clinical Hematology**

★5 (fi 10) (full session, clinical rotation). As a part of a clinical laboratory education for Medical Laboratory Science students, this course will provide experience in a modern hospital hematology laboratory along with weekly tutorials followed by comprehensive theoretical and practical examinations.

**MLSCI 340 Clinical Microbiology**

★5 (fi 10) (full session, clinical rotation). As a part of a clinical laboratory education for Medical Laboratory Science students, this course will provide experience in a modern hospital microbiology laboratory along with weekly tutorials followed by comprehensive theoretical and practical examinations.

**MLSCI 350 Histopathology**

★3 (fi 6) (full session, clinical rotation). As a part of a clinical laboratory education for Medical Laboratory Science students, this course will provide experience in a modern hospital histopathology laboratory along with weekly tutorials followed by comprehensive theoretical and practical examinations.

**MLSCI 360 Clinical Biochemistry**

★6 (fi 12) (full session, clinical rotation). As a part of a clinical laboratory education for Medical Laboratory Science students, this course will provide experience in a modern hospital clinical biochemistry laboratory along with weekly tutorials followed by comprehensive theoretical and practical examinations.

**MLSCI 370 Transfusion Science**

★3 (fi 6) (full session, clinical rotation). As a part of a clinical laboratory education for Medical Laboratory Science students, this course will provide experience in a modern hospital transfusion service laboratory, along with weekly tutorials, followed by comprehensive theoretical and practical examinations.

**MLSCI 410 Introduction to Clinical Laboratory Management**

★1 (fi 2) (second term, 1-0-0). An introduction to the principles of management as they apply to clinical laboratories. Subject matter will include healthcare funding and allocation of funds, the management process in small and large clinical laboratories, performance appraisals, ethics and setting priorities for laboratory services. Prerequisite: consent of Division.

**MLSCI 430 Advanced Hematology**

★3 (fi 6) (second term, 3-0-0). This course is designed to enhance the student's ability to assimilate new and specialized knowledge in an evolving hematology discipline. As such, the course content will change from year to year. Consent of Division is required for non-Medical Laboratory Science students.

**MLSCI 460 Clinical Biochemistry**

★3 (fi 6) (second term, 3-0-0). Advanced lectures on specialized topics including diagnostic enzymology, blood lipids, transplantation biochemistry, hormone receptors and protein purification. Other topics will be considered through studies of case reports. A term paper is part of the requirements for this course. Prerequisite: BIOCH 203 and 205.

**MLSCI 465 Applied Toxicology**

★3 (fi 6) (first term, 3-0-3). A consideration of the protocols and their rationale, used in a large toxicology laboratory. Topics include analytical, environmental, regulatory and inhalation toxicology; clinical and forensic toxicology; and doping related to sports. Prerequisites: BIOCH 203 and 205 or consent of Division.

**MLSCI 466 Applied Toxicology**

★3 (fi 6) (first term, 3-0-0). A consideration of the protocols and their rationale used in a large toxicology laboratory. Topics include analytical, environmental, regulatory, and inhalation toxicology; clinical and forensic toxicology; and doping related to sports. This course is similar to MLSCI 465 except no laboratory sessions will be offered. Prerequisites: BIOCH 203 and 205 or consent of Division.

**MLSCI 475 Clinical Immunology**

★3 (fi 6) (first term, 3-0-0). The application of basic immunology concepts to disease and transplantation, and their monitoring by the clinical laboratory. Topics include the cellular and humoral immune responses, human immune development, immunology and cancer, immune deficiency, autoimmune disease, immunopathology, and transplant immunology. Prerequisite: IMMUN 370 or MICRB 370 or consent of Division.

**MLSCI 480 Molecular Genetic Approaches to the Study and Diagnosis of Disease**

★3 (fi 6) (first term, 3-0-0). Emphasis on the application of techniques of molecular genetics to the practice of Medicine. General subject areas include: organization of the genome, techniques of molecular genetics and their

application to medicine, molecular genetics and oncology, and ethical issues involving these techniques as applied to medicine. Prerequisites: Genetics and BIOCH 203 and 205 or equivalent.

**211.156 Medical Microbiology and Immunology**

Department of Medical Microbiology and Immunology  
Faculty of Medicine and Oral Health Sciences

**Note:** See also INT D 409 and 491 for courses which are offered by more than one department or Faculty and which may be taken as options or as a course in this discipline.

**211.156.1 Undergraduate Courses****MMI 133 Medical Microbiology for Nurses**

★3 (fi 6) (either term, 48 hours). Introductory course in microbiology designed specifically for students of nursing (Collaborative Nursing Program) but open also to those interested in an introduction to medical microbiology. The course deals with basic information on microorganisms and infections and then concentrates on some of the more important pathogenic microorganisms and the diseases they cause. Ways to counteract infections by antibiotics, disinfection and sterilization, and hospital infection control are also covered. (36 hours of lectures; 1-hour mid-term exam; 2-hour final exam; 10 hours of video and discussions.)

**MMI 240 Pathogenic Microbiology**

★6 (fi 12) (full session, 3-0-4). The course considers the role of bacteria, viruses, fungi, and parasites in human disease. Lectures emphasize mechanisms of microbial pathogenicity and immune response to infection. Laboratory emphasizes diagnostic procedures. Prerequisite: BIOL 107. Priority given to Medical Laboratory Science students.

**MMI 241 Pathogenic Microbiology**

★6 (fi 12) (full session, 3-0-0). The course considers the role of bacteria, viruses, fungi, and parasites in human disease. Lectures emphasize mechanisms of microbial pathogenicity and immune response to infection. Prerequisite: RT (CSLT) certification or consent of Department.

**MMI 350 Pathogenic Bacteriology**

★3 (fi 6) (second term, 3-0-4). Medically important bacteria, how they cause disease and the body's immune response to bacteria. Lectures will systematically discuss the organisms and describe their distinctive as well as their common features of structure and pathogenicity. Laboratories will emphasize development of skills and knowledge for the safe handling of infectious bacteria, how medically important organisms are identified and will examine some of the molecular mechanisms of bacterial virulence. Prerequisite: MICRB 265. May not be taken for credit if credit already obtained in MMI 240 or MMI 241.

**MMI 403 Independent Research in Immunology**

★3 (fi 6) (either term, 0-0-3). Research project in an immunology laboratory on a specific topic. Can be taken for credit more than once. Students will make arrangements with a faculty member within the Department to supervise the research project. A final oral presentation on the research project is required for completion of the course. Prerequisites or corequisites: INT D 370 or INT D 371 or INT D 452 and consent of Department.

**MMI 405 Mechanisms of Pathogenicity I**

★3 (fi 6) (first term, 3-3s-0). Selected topics regarding the production of disease by bacterial pathogens, with special emphasis on the biochemical, immunological, and physiological properties of the host and microbe that account for the pathological process. Contemporary concepts will be introduced by means of lectures, laboratories, and student seminars. Prerequisites: BIOCH 203 and 205, and MMI 240 or 241 or 350.

**MMI 411 Introduction to Medical Immunology**

★2 (fi 4) (either term, 32 hours). A general introduction to immunology for students in Phase 1 of the MD program.

**MMI 412 Special Project in Medical Microbiology**

★3 (fi 6) (either term, 0-0-6). Directed individual study. Can be taken for credit more than once. Prerequisite: Consent of Department

**MMI 415 Mechanisms of Pathogenicity II**

★3 (fi 6) (second term, 3-0-0). Mechanisms of pathogenesis by chlamydiae, mycoplasmas, viruses, fungi, and protozoa. Through intensive study of selective systems, down to the molecular level where current knowledge permits, the general principles governing the interactions between human host and pathogen will be examined. Prerequisites: BIOCH 203 and 205, MMI 240 or 241 or 350, and INT D 370 or INT D 371.

**MMI 421 Medical Microbiology and Infectious Diseases**

★6 (fi 12) (full session, 136 hours). An introduction to the basic principles of medical microbiology and the investigation and treatment of infectious diseases. Restricted to Phase II medical students.

**MMI 422 Bacteriology**

★2 (*fi 4*) (first term, 28 hours). An introduction to general bacteriology, aspects of infection and resistance, selected examples of infectious diseases. Special bacteriology of the mouth, including dental caries and periodontal diseases. Course for dental hygiene and dentistry students.

**MMI 425 Medical Virology**

★3 (*fi 6*) (second term, 1-0-5). An introduction to the basic techniques of cell culture and virus propagation and a detailed examination of the principles underlying the identification of viruses of medical importance. Strong emphasis will be placed upon the rationale of viral diagnostic methods. Prerequisites: INT D 224 and consent of Department.

**MMI 426 Medical Parasitology**

★3 (*fi 6*) (second term, 3-0-3). A survey of the protozoan and metazoan parasites of man. Emphasis will be placed on biology epidemiology clinical presentation and laboratory methods for detection and identification as an aid to diagnosis and therapy. Prerequisite: MMI 240 or 241, or consent of Department.

**MMI 427 Fungi in the Human Environment**

★3 (*fi 6*) (first term, 3-0-3). Human health implications of allergenic, toxigenic, and pathogenic fungi will be considered. Topics include pathogenicity, epidemiology, ecology and distribution, occupational and environmental risks of exposure to fungi or their metabolites, immune responses, diversity of fungi involved in human disease, aspects of clinical disease, and therapy. Laboratories will emphasize techniques for detection, isolation, manipulation, and identification of medically important fungi. Prerequisites: Introductory course in medical microbiology (MMI 240 or MMI 350) or mycology (BOT 306) or microbiology (MICRB 265 or 391) or consent of Department.

**MMI 440 Medical Microbiology**

★3 (*fi 6*) (second term, 3-0-0). An advanced level lecture course covering the latest topics in medical microbiology. Topics include models for infectious processes in different organ systems, novel methods for antimicrobial susceptibility testing, the application of molecular techniques in the diagnostic laboratory for HIV, hepatitis B and C, infections in the compromised patient, and strategies for control of infections. The emphasis will be on laboratory applications to infectious processes. Prerequisite: MMI 240 or MMI 241 or MMI 350.

**211.156.2 Graduate Courses**

**Note:** The following undergraduate courses may be taken for credit by graduate students: MMI 405, 415, 425, 426, 427.

**MMI 501 Current Concepts in Immunology**

★3 (*fi 6*) (either term, 0-3s-0). Lecture and seminar course on three to four areas of immunology of current interest based on original literature. The course will emphasize interpretation of published evidence based on theoretical models in the literature and will involve student participation. Offered in alternate years. Prerequisite: INT D 452 or consent of Department.

**MMI 502 Selected Topics in Immunology**

★3 (*fi 6*) (either term, 2-1s-0). Lecture and seminar course covering a particular area of immunology in depth. Offered in alternate years. Prerequisite: INT D 452 or consent of Department.

**MMI 512 Special Projects**

★3 (*fi 6*) (either term, 0-0-3).

**MMI 516 Advanced Techniques in DNA Cloning**

★3 (*fi 6*) (Intersession, 1-0-6). A combined lecture and laboratory course which provides instruction in the basic and advanced techniques used to construct and analyze recombinant DNA molecules. Isolation of DNA and RNA, construction of recombinant DNA molecules in plasmid and phage vectors, isolation and purification of genes by nucleic acid hybridization, amplification of DNA molecules by the polymerase chain reaction, analysis of DNA molecules by restriction endonuclease digestion and DNA sequencing. Strategies for cloning novel genes. Prerequisites: BIOCH 203 and 205, GENET 270 (GENET 390 also recommended) and consent of Department is also required. Designed for advanced undergraduate and graduate students. Offered in alternate years.

**MMI 520 Bacterial Plasmids**

★3 (*fi 6*) (first term, 3-0-0). The biology of plasmids and plasmids as tools for molecular biology. The structure and properties of various bacterial plasmids (antibiotic resistance plasmids, colicin and enterotoxin-producing plasmids) will be considered in light of our current understanding of the evolution of plasmids. The involvement of insertion sequences and transposons in plasmids organization will be discussed. The course will focus on the modes of plasmids DNA replication and the means by which bacterial plasmids are maintained in host cells. Important plasmid-coded functions such as incompatibility and conjugative transfer will be discussed in detail. The effect of plasmids in human and veterinary medicine and on plant pathogenesis (the crown gall disease) will also be considered. The use of plasmids in genetic engineering including the choice of vectors, cloning

methods and risks and benefits will complete the course. Note: Designed for advanced honors and graduate students and offered in alternate years. Prerequisites: BIOCH 203 and 205, GENET 270, or consent of Department.

**MMI 601 Seminar in Medical Microbiology and Immunology**

★3 (*fi 6*) (either term, 0-3s-0). The student will prepare a seminar on an assigned topic in medical microbiology or immunology. Evaluation will focus on presentation, content, discussion of other student seminars, and proficiency in chairing other presentations. Required of all second- and third-year graduate students in medical microbiology and immunology. Open to graduate students in Medical Microbiology and Immunology only.

**211.157 Medicine**

Department of Medicine  
Faculty of Medicine and Oral Health Sciences

**211.157.1 Undergraduate Courses****211.157.1.1 Department of Medicine Courses****MED 400 Two Week Medical Elective**

★0 (*fi 1*) (2 week period). This represents a contract period of registration with variable start and end dates for undergraduate medical students who are undertaking clinical electives. The type of clinical elective is open to any area of specialization. Prerequisite: enrollment in an MD program and approval by the Electives Coordinator of the Faculty of Medicine.

**MED 401 Four Week Medical Elective**

★0 (*fi 1*) (4 week period). This represents a contract period of registration with variable start and end dates for undergraduate medical students who are undertaking clinical electives. The type of clinical elective is open to any area of specialization. Prerequisites: enrollment in an MD program and approval by the Electives Coordinator of the Faculty of Medicine.

**MED 402 Eight Week Medical Elective**

★0 (*fi 2*) (8 week period). This represents a contract period of registration with variable start and end dates for undergraduate medical students who are undertaking clinical electives. The type of clinical elective is open to any area of specialization. Prerequisites: enrollment in an MD program and approval by the Electives Coordinator of the Faculty of Medicine.

**MED 403 Twelve Week Medical Elective**

★0 (*fi 3*) (12 week period). This represents a contract period of registration with variable start and end dates for undergraduate medical students who are undertaking clinical electives. The type of clinical elective is open to any area of specialization. Prerequisites: enrollment in an MD program and approval by the Electives Coordinator of the Faculty of Medicine.

**MED 418 Clinical Informatics**

★2 (*fi 4*) (10 hours, either term) This course provides an introduction to computer information resources and analysis as applied to clinical medicine. For first-year medical students only.

**MED 419 Human Sexuality**

★3 (*fi 6*) (first term, 16 hours) This course provides an introduction and overview to the approach to human sexuality as it applies to clinical medicine. For first-year medical students only.

**MED 421 Neurological Sciences**

★5 (*fi 10*) (full session, 111 hours). This course covers the elements of clinical Neuroanatomy and fundamental clinical Neurosciences. The course in Neuroanatomy is designed to provide basic information on the structure and function of the human central nervous system. Lectures emphasize vascular arrangements, functional areas and major ascending and descending neural pathways important in understanding the localization and spread of disease, diagnostic principles and approach to treatment. Lectures are followed by student dissections of the human brain and spinal cord, prosection demonstrations, sessions on diagnostic neuroradiology, clinics and small group case-based problem-solving sessions (PBL). The course is organized by the Department of Cell Biology and Anatomy and the Divisions of Neurology and Neurosurgery, with contributions from the Department of Radiology and Diagnostic imaging and the Department of Pharmacology.

The Clinical Neuroscience course consists of a series of lectures on core topics in clinical neurology, including the methods of localizing neurological lesions using the history and physical examination, and also a discussion of the most common neurological diseases. In addition, there are small group case-based problem-solving sessions and bedside sessions during which students are taught how to perform a neurological examination.

Evaluation is based on two final examinations (one in Neuroanatomy, comprised of written and laboratory components, and one in clinical Neurosciences). Students must pass both examinations or are deemed to have failed this course. Open to MD students only.

**MED 422 Topics in Medical Subspecialties (including Endocrinology, Gastroenterology and Hematology)**

★7 (*fi 14*) (either term, 103 hours). This course is made up of three subcourses. Students must pass all three subcourses or are deemed to have failed. For Phase II medical students only.

**MED 423 Topics in Medical Subspecialties (including Cardiology, Endocrinology, Gastroenterology, Hematology, Nephrology, and Pulmonary)**

★8 (*fi 16*) (either term, 119 hours). For Phase II medical students only.

**MED 433 Topics in Dermatology**

★1 (*fi 2*) (first term, 16 hours). For third year medical students only.

**MED 434 General Medicine**

★1 (*fi 2*) (second term, 15 hours). General aspects of medicine with particular reference to local and systematic diseases of dental interest.

**MED 436 Nephrology—Pathophysiology of Clinical Renal Disease and Related Disorders**

★3 (*fi 6*) (first term, 29 hours). In-depth review of renal physiology and pathophysiology. Will cover normal mechanisms of acid base and fluid balance, renal function testing; pathophysiology associated with urinary tract infection; inflammatory and degenerative disorders, renal failure. Prerequisites: NURS 313 and consent of Division of Nephrology. Preference to students with interest and experience in nephrology nursing.

**MED 445 Internship in Geriatrics**

★1.5 (*fi 3*) (either term, 2 weeks). This rotation consists of clinical experience in the assessment and management of ambulatory patients through clinics and home visits as well as comprehensive assessment of frail-complex inpatients. The clinical experience is supported by didactic teaching of geriatric syndromes. Student Internship for students in Phase III MD program only.

**MED 446 Student Internship**

★7.5 (*fi 15*) (full session, 10 weeks). Student internship for students in Phase III, MD program only.

## 211.157.1.2 Department of Medicine Courses

**MED 410 Medical Ethics and Jurisprudence**

★1 (*fi 2*) (first term, 7 hours). Introduction to central issues in biomedical ethics and to the philosophical methods for dealing with them. Restricted to MD students.

**MED 411 Clinical Skills**

★4 (*fi 8*) (full session, 95 hours). An introductory course in the communication and clinical skills necessary for effective history taking and in the applied anatomy of the body regions.

**MED 413 Introduction to Nutrition**

★2 (*fi 4*) (either term, 36 hours). A general introduction to Nutrition for first year medical students.

**MED 414 Interdisciplinary Course on Topics in Growth and Development**

★2 (*fi 4*) (either term, 34 hours). Interdisciplinary course on topics in growth and development. For first-year medical students only.

**MED 417 Selectives and Electives**

★0 (*fi 2*) (either term, 24 hours). A program of selective courses described in detail in the Faculty's Selective and Electives catalogue. This program forms a mandatory part of Phase I of the MD program. Consent of Instructor is required. This course is restricted to medical students.

**MED 420 Comprehensive Examination**

★5 (*fi 10*) (full session) Open only to second-year medical students.

**MED 425 Interdisciplinary Course on Clinical Skills**

★2 (*fi 4*) (full session, 38 hours). For Phase II medical students only.

**MED 426 Interdisciplinary Course on Medical Ethics and Jurisprudence**

★1 (*fi 2*) (full session, 29 hours). For Phase II medical students only.

**MED 427 Elective**

★0 (*fi 1*) (first term, 12 hours). A program of elective courses as described in detail in the Faculty's Electives catalogue. This program forms a mandatory part of Phase II of the MD program. Consent of the instructor is required. This course is restricted to medical students.

**MED 431 Procedural Skills**

★1 (*fi 2*) (first term, 16 hours). For third year medical students only.

**MED 432 Musculoskeletal Systems**

★3 (*fi 6*) (first term, 73 hours). This interdivisional course will cover the following topics: orthopaedics, rehabilitation medicine and rheumatology. For third year medical students only.

**MED 440 Comprehensive Examination**

★0 (*fi 0*) (full session) Open only to fourth-year medical students.

**MED 441 Clinical Problems**

★0 (*fi 2*) (full session, 36 hours). A lecture series available to students in Phase III, MD program only.

**MED 442 Review of Internship Medicine**

★0 (*fi 4*) (second term, 56 hours). A review of topics in Internal Medicine. For fourth year medical students only.

**MED 447 Elective**

★0 (*fi 44*) (full session, 16 weeks). A program of elective courses described in detail in the Faculty Electives catalogue. This program forms a mandatory part of Phase III. For third and fourth year medical students only. Consent of Instructor is required.

## 211.157.2 Graduate Courses

## 211.157.2.1 Department of Medicine Courses

**MED 501 Clinical Pulmonary Physiology**

★3 (*fi 6*) (second term, 2-0-0). Basic and clinical lectures on: Lung Structure; Pulmonary Blood Flow; Airflow; Gaseous Diffusion; Ventilation/Perfusion Matching; Control of Ventilation; Oxygen Transport; Lung Defense; Mucociliary Transport; ARDS; Asthma; Exercise; Lung Growth; Surfactant; Lung Metabolism; Pulmonary Function Testing. Prerequisites: General courses in Physiology, Physics and Biochemistry or consent of Department.

**MED 571 Directed Reading in the Basic Medical Sciences**

★3 (*fi 6*) (either term, 3-0-0). Reading and study of basic medical science topics relevant to the student's chosen field of study under the direction of one or more faculty members. Prerequisite: consent of Department.

**MED 573 Directed Reading in Clinical Medicine**

★3 (*fi 6*) (either term, 3-0-0). Reading and study in a field of clinical medicine relevant to the student's chosen field of study under the direction of one or more faculty members. Readings currently available in GI Physiology, Experimental Hematology, Steroid Receptors, Cardio-physiology, Renal Physiology, and Endocrinology. Prerequisite: consent of Department.

**MED 575 Nutrition and Metabolism**

★3 (*fi 6*) (full session, 1-1s-0). A seminar and discussion course in advanced nutrition and metabolism that examines current topics in nutrition and features regular seminars on alternate weeks throughout both terms of the winter session. A discussion group meets after each seminar. Preference will be given to graduate and postgraduate students in the area of nutrition and metabolism. Maximum enrolment of 15. Prerequisite: consent of Department.

## 211.157.2.2 Department of Medicine Courses

**Note:** See also INT D 570 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.

## 211.158 Microbiology (Biological Sciences)

Department of Biological Sciences  
Faculty of Science

**Notes**

- (1) See the following sections for listings of other Biological Sciences courses: Biology (BIOL) §211.23; Botany (BOT) §211.26; Entomology (ENT) §211.88; Genetics (GENET) §211.111; Zoology (ZOOL) §211.239
- (2) See also Laboratory Animal Management Listing (§211.133)

## 211.158.1 Undergraduate Courses

**MICRB 265 General Microbiology**

3 (*fi 6*) (either term, 3-0-4). This course will focus on the structure and physiology of free-living and pathogenic bacteria. The diversity of their metabolic activities, the interaction of microbes with their environment, symbiotic relationships and cell-to-cell communication are major topics. Lectures and laboratory exercises are coordinated to explore topics in basic microbiology, environmental microbiology, molecular microbiology, and the production of economically or medically important products through microbial biotechnology. Prerequisites: BIOL 107 and 108; Prerequisites or corequisites: BIOCH 220 or 203/205. NOTE: Students planning on taking senior MICRB courses must take BIOCH 203/205.

**MICRB 311 Microbial Physiology**

★3 (*fi 6*) (first term, 3-0-0). The structure, growth, and metabolic path-ways used by bacteria, yeasts, and molds. Emphasis is placed on the comparative biochemical aspects of microbial life. Prerequisites: MICRB 265, BIOCH 203 and 205.

**MICRB 313 Microbial Physiology Laboratory**

★3 (*fi 6*) (first term, 0-6L-0). Laboratory exercises introduce the microanalytical

techniques used for measuring microbial growth and for following metabolic events at the cellular and subcellular level. Prerequisite or corequisite: MICRB 311.

#### **MICRB 316 Molecular Microbiology**

★3 (*fi 6*) (second term, 3-0-0). The response of microbes to changes in their environment at the molecular level. Topics will include sporulation, signal transduction, chemotaxis, heat shock response, oxygen stress, osmolarity, pilus expression, and mechanisms of genetic transfer. Prerequisites: INT D 224, MICRB 265 and BIOCH 203/205.

#### **MICRB 343 Topics In Microbial Laboratory Techniques**

★3 (*fi 6*) (second term, 3-0-0). Description and critical discussion of current techniques used for the isolation and characterization of macromolecular constituents of prokaryotic cells. Emphasis will be placed on examples from the recent literature. Prerequisite MICRB 313.

#### **MICRB 345 Microbial Laboratory Techniques**

★3 (*fi 6*) (second term, 0-0-3). A series of laboratory projects employing current techniques used in the isolation and characterization of macromolecular constituents of prokaryotic cells, including enzymes, plasmids and RNA molecules. Prerequisite MICRB 313. Corequisite MICRB 343. Credit may not be obtained for both MICRB 344 and 345.

#### **MICRB 391 Environmental Microbiology**

★3 (*fi 6*) (first term, 3-0-0). Interactions between microorganisms and the environment. Topics include methods of sampling various environments, methods for monitoring microbial activities, petroleum microbiology, bioremediation, survival of airborne microorganisms, microbial metabolism of selected pollutants. Prerequisite: MICRB 265 and BIOCH 203/205.

#### **MICRB 392 Laboratory Methods for Environmental Microbiology**

★3 (*fi 6*) (first term, 0-0-6). Laboratory experiments evaluate methods for enumerating bacteria from aquatic environments and introduce methods for monitoring their metabolic activities. Factors that influence petroleum biodegradation and comparisons of methods for sampling airborne microorganisms are also studied. Strong emphasis on statistical analysis of numerical data obtained. Restricted to Honors or Specialization students in Biological Sciences or consent of Department. Prerequisite or corequisite: MICRB 391.

#### **MICRB 401 Molecular Immunology**

★3 (*fi 6*) (second term, 3-0-0). Molecular aspects of immunology. Qualitative and quantitative reactions, properties, and structures of antibodies and antigens. Prerequisites: MICRB 193, 370 (or equivalent) and a university course in Biochemistry. Offered in alternate years.

#### **MICRB 406 Topics in Cell Biotechnology**

★3 (*fi 6*) (full session, 0-2s-0). This course is designed to develop familiarity with current research literature in Cell Biotechnology. Note: Restricted to Honors Cell Biotechnology students. Prerequisites: A 300-level Microbiology course and consent of the Cell Biotechnology Committee.

#### **MICRB 410 Structure of Microorganisms**

★3 (*fi 6*) (second term, 3-0-0). Cellular structure of bacteria and lower eukaryotes with particular emphasis on the use of antibiotics as tools for investigating cell structure. Prerequisite: MICRB 311.

#### **MICRB 415 Industrial Microbiology**

★3 (*fi 6*) (second term, 3-0-0). Microbial production of commercially important metabolites and products. Emphasis will be placed on control and regulation of metabolic pathways involved in the production of these microbial products and the use of genetic manipulation to improve production levels. Prerequisites: GENET 270 and MICRB 311.

#### **MICRB 420 New Directions in Antibiotic Research**

★3 (*fi 6*) (first term, 3-0-0). Selected topics in antibiotic research will be discussed, with emphasis on molecular genetic studies from the recent literature. Prerequisites: GENET 270 and MICRB 311.

#### **MICRB 450 Fermentation Biotechnology**

★6 (*fi 12*) (full session, 1-0-6). This course will describe the use of microbes and recombinant DNA constructs in fermentation technology. Course material will also include theoretical aspects of kinetics, design, scale-up and downstream processing. The selection, modification and optimization of the proper organism, medium and fermentation facility and economic considerations will be discussed. Prerequisites: MICRB 311, 313.

**Note:** For other immunology courses not listed above, see GENET 371 and IMMUN 500.

### 211.158.2 Graduate Courses

#### **Notes**

- (1) All 300 and 400 level courses in the Department of Biological Sciences may be taken for credit by graduate students with approval of the student's supervisor or supervisor committee.
- (2) The following courses may be taken as an option in graduate programs in the Department of Biological Sciences with approval of the student's

supervisor or supervisory committee: BIOCH 510, 520, 530, 540, 541, 550, 555, 560; CHEM 361, 363, 461; CELL 300, 301; INT D 371, 372, 421, 452, 455, 464, 543, 544, 545, 551; MA SC 400, 401, 402, 410, 412, 420, 425, 430, 437, 440, 445, 450, 454, 470, 480; MMI 350, 405, 415, 516, 520; NEURO 472, 503, NU FS 363; PALEO 318, 319; PHARM 601.

#### **MICRB 510 Advanced Topics in Microbial Structure**

★3 (*fi 6*) (second term, 3-0-0). Lecture course on cellular structure of prokaryotes with particular emphasis on experimental methodologies. Oral presentations will be required. Prerequisite: consent of the Department.

#### **MICRB 514 Advanced Topics in Microbiology**

★3 (*fi 6*) (second term, 3-0-0). This course will consist of mini-series of lectures by rotating department faculty members dealing with their special research and general interest areas. Topics covered will vary from year to year. The course will be required of all first or second year graduate students in the Department of Microbiology and open to graduate students from other departments who have had advanced courses in microbiology (400-level courses). Consent of Department required.

#### **MICRB 516 Advanced Topics in Molecular Microbiology**

★3 (*fi 6*) (second term, 3-1s-0). Lecture and seminar course on molecular mechanisms found in prokaryotes based on the current literature. Grades will be assigned on the basis of participation at weekly seminars as well as written analyses of assigned readings. Prerequisite: consent of the Department.

#### **MICRB 591 Environmental Microbiology**

★3 (*fi 6*) (first term, 3-0-0). Interactions between microorganisms and their environment. Topics include methods of sampling various environments, methods for monitoring microbial activities, petroleum microbiology, bioremediation, survival of airborne microorganisms, microbial metabolism of selected pollutants. Lectures and exams are the same as MICRB 391, but preparation of a major term paper and an oral presentation will be required. Prerequisite: MICRB 265 and/or consent of Department.

#### **MICRB 606 Graduate Seminar**

★3 (*fi 6*) (full session, 0-3s-0). Required of all graduate students in the area of Microbiology when not enrolled in MICRB 607. Grading system will consist of CR/F.

#### **MICRB 607 Graduate Seminar**

★6 (*fi 12*) (full session, 0-3s-0). Required of all second-year graduate students in the area of Microbiology.

### 211.159 Mineral Engineering

School of Mining and Petroleum Engineering, Department of Civil and Environmental Engineering  
Faculty of Engineering

**Note:** See also Materials Engineering; Mining Engineering; Mining and Petroleum Engineering; and Petroleum Engineering listings.

#### 211.159.1 Graduate Courses

##### **MNL E 630 Advanced Topics in Coal Preparation**

□3.0 (*fi 6*) (either term, 3-0-0). Advanced topics in coal preparation, including the modelling of unit operations used in coal preparation, circuit analysis and optimization and process control. Coal preparation economies. Prerequisite: MATE 331. (★3)

##### **MNL E 635 Coal Conversion and Utilization**

□3.0 (*fi 6*) (either term, 3-0-0). Coal processing, with emphasis on carbonization, gasification, liquefaction, and selected aspects of combustion and pollution abatement techniques. Prerequisite: MET E 535. (★3)

##### **MNL E 640 Advanced Topics in Mineral Process Engineering**

□3.0 (*fi 6*) (either term, 3-0-0). An advanced treatment of selected topics of current interest in mineral process engineering. (★3)

##### **MNL E 682 Graduate Seminar**

□0.5 (*fi 2*) (variable, 0-1s-0). Discussion of progress and problems in research under way in the mining and mineral process area of the Department. (★1)

#### 211.160 Reserved

### 211.161 Mining Engineering

School of Mining and Petroleum Engineering  
Department of Civil and Environmental Engineering  
Faculty of Engineering

**Note:** See also Materials Engineering; Mining and Petroleum Engineering; and Petroleum Engineering listings.

The following table lists renumbered courses effective 1993/94:

Old	New	Old	New
MIN E 395	MIN E 295	MIN E 503	MIN E 403
MIN E 410	MIN E 310	MIN E 507	MIN E 407
MIN E 423	MIN E 323	MIN E 510	MIN E 408
MIN E 424	MIN E 324	MIN E 513	MIN E 413
MIN E 430	MIN E 330	MIN E 514	MIN E 414
MIN E 501	MIN E 401	MIN E 528	MIN E 428
MIN E 502	MIN E 402		

## 211.161.1 Undergraduate Courses

### MIN E 295 Introduction to Mining Engineering

□3.8 (*fi 6*) (second term, 3-0-3/2). The relationships of geology, rock mechanics, labor productivity, and economic factors to the selection, planning, design, and safe operation of mining systems. Environmental planning and impact mitigation principles. Determination of the mine/mill product price required to provide a specified rate of return on capital investment. Prerequisite: consent of Instructor. (★3)

### MIN E 310 Ore Reserve Estimation

□3.0 (*fi 6*) (first term, 3-0-0). Genesis of mineral deposits, sampling and estimation of ore grades and volumes, conventional ore reserve estimation techniques, estimation of reserves using GEMCON geological modelling software, evaluation of reserves by geostatistical techniques, report on computer modelling project. Prerequisites or corequisites: MATH 200 and STAT 235 and EAS 210. (★3)

### MIN E 323 Rock Mechanics

□4.5 (*fi 6*) (first term, 3-0-3). Mechanical properties of rock masses, field and laboratory determination; classification and index testing; permeability and flow; stresses around underground openings, elastic prototypes and numerical methods; ground support principles and mechanics of common support systems, loads on supports; hydraulic backfill, earth pressures, consolidation theory and practical consequences in mining; mechanics of subsidence and caving; rockburst mechanics; slope stability, rock mechanics instrumentation. Prerequisite: CIV E 270 or consent of Instructor. (★3)

### MIN E 324 Drilling, Blasting, and Explosives

□3.0 (*fi 6*) (either term, 3-0-0). Drilling methods, breakage mechanics, performance, and equipment. Explosive characteristics, initiation systems, selection, handling, and loading. Blasting, rock dynamics, design of surface and underground blasts, fragmentation prediction, vibrations and damage control, monitoring. Prerequisite MIN E 295 or consent of Instructor. (★3)

### MIN E 325 Mine Planning and Design

□3.0 (*fi 6*) (first term, 3-0-0). Planning of surface mines; pit designs, pit limits and optimization; haul road design; waste dump design; and mine plan requirements. Planning of underground mines; mine access and development methods; mine layout and mine plan requirements. Prerequisites: MIN E 295 and CIV E 265. (★3)

### MIN E 330 Mine Transport and Plant Engineering

□3.8 (*fi 6*) (second term, 3-0-3/2). Covers underground and surface mine transport systems, rail haulage, hoisting, conveying and slurry pipelining. Auxiliary mining services such as electric power distribution, pumping and compressed air power. Seminars will include design problems dealing with the materials taught in the classroom. Oral presentation is required. Prerequisites: MIN E 295 and EE 201 and CH E 312 or consent of Instructor. (★3)

### MIN E 402 Mine Design Project I

□3.8 (*fi 6*) (second term, 0-3/2-6). First phase of a full Prefeasibility Study of a commercial mining property. Data collection, preparation of geological model using GEMCON software. Calculate reserves and prepare plans and sections. Prepare geotechnical, hydrogeological, hydrological and marketing sections of study for Mine Design Project II (see MIN E 403). Prepare report, present report at seminar. Weekly meeting with project supervisor. Prerequisites or corequisites: MIN E 413 and MIN E 414. (★3)

### MIN E 403 Mine Design Project II

□3.8 (*fi 6*) (second term, 0-3/2-6). Second phase of a full Prefeasibility Study of a commercial mining property. This phase follows on from Phase I (MIN E 402) requiring the development of conceptual mine plans, detailed mine plans and equipment selection, environmental aspects, capital and operating cost estimates and financial and economic analyses. Prepare report. Submit report and present at seminar. Weekly meeting with project supervisor. Prerequisite: MIN E 402. (★3)

### MIN E 407 Principles of Mine Ventilation

□3.8 (*fi 6*) (second term, 3-0-3/2). Principles and practices for control of the underground environment including application of software and governing legislation. Prerequisite: CH E 312, MIN E 414, or equivalent. (★3)

### MIN E 408 Mining Enterprise Economics

□2.0 (*fi 4*) (first term, 2-0-0). Estimating operating and capital costs and revenues related to mine development. Taxation, profitability analysis,

budgeting, organization of mining companies. Economic analyses of selected Canadian mining companies. Prerequisites: MEC E 310 or consent of Instructor. (★2)

### MIN E 413 Surface Mining Methods

□3.8 (*fi 6*) (first term, 3-0-3/2). Surface mining methods, equipment types specification and operation; production and productivity; control of operations; mine drainage; land conservation and reclamation. Laboratories will include introduction to GEMCON Mine Planning software. Prerequisites: MIN E 310, MIN E 330 and MIN E 323 or consent of Instructor. (★3)

### MIN E 414 Underground Mining Methods

□3.8 (*fi 6*) (first term, 3-0-3/2). Underground mining methods; Equipment types; specification and operation, mine organization, labour productivity, cost estimating and cost control. Methods studied include room-and-pillar, sublevel stoping and caving, vertical crater retreat, block caving, selective methods for vein mines, and underground coal mining systems. Laboratories will include introduction to GEMCON Mine Planning Software. Prerequisites: MIN E 323 and 324 or consent of Instructor. (★3)

### MIN E 420 Mine Equipment Selection and Maintenance

□3.0 (*fi 6*) (second term, 3-0-0). Equipment selection principles; equipment sizing and matching; mining/mechanical/electrical aspects; capital and operating costs; decision/risk analysis; purchasing principles; maintenance principles and practices; maintenance characteristics of major equipment, maintenance support facilities. Prerequisite: MIN E 413 or 414 or consent of Instructor. (★3)

### MIN E 428 Mining Field Trip

□0.5 (*fi 1*) (either term, 0-1s-0). An extended trip to visit surface and underground mines is made every year by students entering third or fourth year Mining Engineering, accompanied by staff. A report on the trip is to be submitted. All Mining students may be required to make other field trips during the sessions. Prerequisite: MIN E 295. (★0.5)

### MIN E 555 Special Topics in Mining Engineering

□3.0 (*fi 6*) (either term, 3-0-0). Research studies and/or projects dealing with selected metal, nonmetal and coal mining subjects. Suitable subjects are chosen in consultation with a mining engineering faculty member. Typical study categories are reserve evaluation, surface and underground mining methods and operations, mine planning, computer simulation of mining operations, mineral processing, ventilation, regulations, mine safety, feasibility studies, economics and management. Prerequisite: consent of Instructor (★3)

## 211.161.2 Graduate Courses

### MIN E 602 Design Project I

□3.0 (*fi 6*) (first term, 3-0-0). Design of a mining operation. (★3)

### MIN E 603 Design Project II

□3.0 (*fi 6*) (second term, 3-0-0). Continuation and extension of MIN E 602. (★3)

### MIN E 611 Mining Property Evaluation

□3.0 (*fi 6*) (second term, 3-0-0). Ore reserve estimation, with emphasis on geostatistical techniques. Cost estimation, taxation, feasibility analysis, computer simulation approach to decision making. PET E 685 is recommended as either an alternative or complementary course. (★3)

### MIN E 620 Rock Mechanics

□3.0 (*fi 6*) (either term, 3-0-0). An advanced treatment of selected topics in rock mechanics. (★3)

### MIN E 621 Geomechanics in Underground Mining

□3.0 (*fi 6*) (either term, 3-0-0). Energy changes due to mining; multi-seam mining; interactions; pillar design in hard rock, coal and potash; strata mechanics in longwall and shortwall coal mining; rock mechanics of potash mining and caving methods; rock bursts and bumps; subsidence; underground rock mechanics instrumentation and applications of numerical methods of stress analysis. Prerequisite: MIN E 323 or equivalent. (★3)

### MIN E 622 Surface Mining Systems and Equipment

□3.0 (*fi 6*) (second term, 3-0-0). An advanced treatment of selected topics in surface mine design, selection of mine equipment, and planning of operations. Prerequisite: MIN E 413 or consent of Instructor. (★3)

### MIN E 623 Rock Slope Stability in Surface Mining

□3.0 (*fi 6*) (either term, 3-0-0). Economic, operational and geological factors affecting slope design. Design stages; collection of structural and strength data. Data synthesis, interpretation, design values. Methods of design, deterministic and probabilistic methods. Bench design. Controlled blasting; stabilization techniques. Monitoring. Spoil pile stability. Prerequisite: MIN E 323 or equivalent. (★3)

### MIN E 630 Advanced Mine Transport

□3.0 (*fi 6*) (either term, 3-0-0). Advanced studies in the methods and systems of material movement in mines. In-depth consideration of selection, specifications, and costs of transportation for surface and underground mines. Prerequisites: MIN E 330 and 413, or 414, or consent of Instructor. (★3)

**MIN E 640 Simulation of Industrial Systems**

□3.0 (fi 6) (first term, 3-0-0). Formulation of models of engineering problems and industrial systems for experimentation using a general purpose simulation language. Statistical and operational validation of simulation results. Prerequisite: consent of Instructor. (★3)

**MIN E 650 Special Topics in Mining Engineering**

□3.0 (fi 6) (either term, 3-0-0). Special studies of developments of current interest within the mining industry in exploration, mining methods, mine planning, mine simulation, environment, regulations, economics and management; e.g. tar sands mining, ocean mining, in situ gasification. (★3)

**MIN E 682 Graduate Seminar**

□0.5 (fi 2) (variable, 0-1s-0). Discussion of progress and problems in mining research. (★1)

**MIN E 710 Mining**

□3.0 (fi 6) (either term, 3-0-0). Readings and discussion of selected topics in mining engineering. (★3)

**211.162 Mining and Petroleum Engineering**

Department Civil and Environmental Engineering  
Faculty of Engineering

**Note:** See also Mining Engineering, Materials Engineering, and Petroleum Engineering listings.

The following table lists renumbered courses effective 1997/98:

Old	New	Old	New
MMP E 392	MP E 292	MMP E 508	MP E 408
MMP E 422	MP E 322	MMP E 597	MP E 497
MET E 431	MP E 331	MMP E 599	MP E 499
MMP E 490	MP E 390		

**211.162.1 Undergraduate Courses**

**MP E 292 Using Technology to Create Resource Enterprises**

□3.0 (fi 6) (first term, 3-0-0). An introduction to mining, metallurgical and petroleum engineering based on lectures that explain how professional knowledge and expertise in the many technologies that comprise each of these engineering fields are used to create and maintain business enterprises. Exploration techniques to find mineral and petroleum deposits. Unit operations for hardrock and coal mining, petroleum and natural gas recovery. Selection of mining and petroleum production methods to maximize recovery and profitability. Processing and refining of metal, nonmetal and hydrocarbon raw materials. Determining economic feasibility and return on capital investment. Prerequisite: Completion of the first two terms of engineering, science or business. (★3)

**MP E 322 Rock Structures and Intact Rock Properties**

□3.5 (fi 6) (second term, 3-1s-0). Rock texture and fabric; compaction, fracture and deformation properties, effect of environment and time, strength theories. State of stress in the Earth's crust and its measurement. Formation, geometry and classification of depositional, diastrophic and non-diastrophic structures including bedding, jointing, faulting, folding, cleavage. Representation of structures on maps and stereographic projections. Prerequisite: CIV E 270 or consent of Instructor. (★3)

**MP E 497 Operations Research**

□3.5 (fi 6) (first term, 3-1s-0). Simulation, linear programming; network analysis; dynamic programming. (★3)

**MP E 499 Undergraduate Seminar**

□1.0 (fi 2) (first term, 1-0-0). Special lectures and discussions on topics in engineering. (★1)

**211.162.2 Graduate Courses**

**MP E 900 Directed Research**

★6 (fi 12) (variable). An engineering project for students registered in a Master of Engineering program.

**211.163 Music**

Department of Music  
Faculty of Arts

The following table lists renumbered courses effective 1990/91:

Old	New	Old	New
MUSIC 200	MUSIC 100	MUSIC 339	MUSIC 239
MUSIC 206	MUSIC 101	MUSIC 340	MUSIC 240
MUSIC 222	MUSIC 122	MUSIC 341	MUSIC 241
MUSIC 224	MUSIC 124	MUSIC 351	MUSIC 251
MUSIC 228	MUSIC 128	MUSIC 360	MUSIC 259/260

Old	New	Old	New
MUSIC 229	MUSIC 129	MUSIC 365	MUSIC 265
MUSIC 240	MUSIC 140	MUSIC 403	MUSIC 303
MUSIC 241	MUSIC 141	MUSIC 404	MUSIC 304
MUSIC 251	MUSIC 151	MUSIC 415	MUSIC 315
MUSIC 265	MUSIC 165	MUSIC 420	MUSIC 320
MUSIC 306	MUSIC 201	MUSIC 503	MUSIC 403
MUSIC 307	MUSIC 207	MUSIC 504	MUSIC 404
MUSIC 313	MUSIC 213	MUSIC 533	MUSIC 433
MUSIC 315	MUSIC 215	MUSIC 534	MUSIC 434
MUSIC 322	MUSIC 222	MUSIC 535	MUSIC 435
MUSIC 324	MUSIC 224	MUSIC 558	MUSIC 459
MUSIC 325	MUSIC 225	MUSIC 675	MUSIC 721
MUSIC 330	MUSIC 230	MUSIC 679	MUSIC 739
MUSIC 331	MUSIC 231		

**211.163.1 Undergraduate Courses**

**MUSIC 100 Rudiments of Music**

★3 (fi 6) (either term, 3-0-0). Fundamentals of music theory approached through aural and written training. Note: Not available for degree credit to students enrolled in a BMus (all routes) degree program.

**D MUSIC 101 Introduction to Music**

★3 (fi 6) (either term, 3-0-0). A study of music literature with an emphasis on listening and analytical tools. A brief survey of the history of Western music will be included. Note: Not open to BMus (all routes) students.

**MUSIC 122 Second Practical Subject**

★3 (fi 6) (full session, 1-0-0). Note: Admission restricted to BMus (all routes) students, and BEd students majoring in secondary music education. Prerequisite: consent of Department.

**MUSIC 124 Applied Music**

★3 (fi 6) (full session, 1-0-0). For non-BMus students. Prerequisite: consent of Department, based upon audition.

**MUSIC 125 Applied Music**

★6 (fi 12) (full session, 2-0-0). Restricted to BMus students.

**MUSIC 128 Voice Class**

★3 (fi 6) (full session, 0-2L-0). Fundamental vocal skills. Restricted to second study BMus (all routes) and BEd Music Major/Minor students. Prerequisite: consent of Department.

**MUSIC 129 Fundamental Keyboard Skills**

★3 (fi 6) (full session, 0-2L-0). Prerequisite: consent of Department. Restricted to BMus (all routes) and BA Honors Music Major students.

**S MUSIC 140 Choral Ensemble**

★3 (fi 6) (full session, 0-4L-0). Concert Choir or Madrigal Singers. Prerequisite: consent of Department, based upon audition.

**S MUSIC 141 Instrumental Ensemble**

★3 (fi 6) (full session, 0-4L-0). Concert Band, Wind Ensemble, Academy Strings, Orchestral Winds, or Jazz Band I or II. Prerequisite: Consent of Department based upon audition.

**MUSIC 151 Aural and Keyboard Skills I**

★3 (fi 6) (full session, 0-3L-0). The development of basic musicianship skills through dictation and performance of pitch, rhythmic, and keyboard exercises. Prerequisite: MUSIC 100 or satisfactory completion of Dept. of Music Theory Placement and Aural Skills Examinations for other than BMus students. Corequisite: MUSIC 155 or 156.

**S MUSIC 155 Music Theory I**

★3 (fi 6) (either term, 3-0-0). A study of "common-practice" harmony, including elementary analysis with preliminary discussion of elements of formal contrapuntal writing and chorale texture. Prerequisite: MUSIC 100 or satisfactory completion of Department of Music Theory Placement Examination. Note: Not open to students with credit in MUSIC 150.

**S MUSIC 156 Music Theory II**

★3 (fi 6) (either term, 3-0-0). Continuing the study of "common-practice" harmony and elementary formal analysis. Prerequisite: MUSIC 155. Note: Not open to students with credit in MUSIC 150.

**S MUSIC 165 Introduction to World Music**

★3 (fi 6) (either term, 3-0-0). Note: Not to be taken by students with credit in MUSIC 309.

**Note:** The ability to read music is required for all courses listed below.

**MUSIC 170 Introduction to Music History**

★3 (fi 6) (first term, 3-0-0). Issues in and approaches to the historical study of music. Topics drawn from a variety of musical traditions and historical periods. Prerequisite: MUSIC 100 or successful completion of the Department of Music Rudiments Placement Exam. Registration priority given to BMus, BEd Music Major/Minor, BA (Honors) Music Major, and BA Music Major/Minor students.