

Calendar Home

One Hundred and Twenty Fourth Session

The Calendar on the Engineering and Applied Science website is an official publication of the Faculty Board. This Calendar is the prevailing and official record of the academic regulations, academic plans of study, descriptions of courses of instruction, and requirements for graduation in all undergraduate plans in the Faculty. It can only be amended by Faculty Board. Amendments will be recorded in the Minutes of the Board and are included in the on-line Calendar.

Students looking for the 2016-2017 or 2015-2016 Calendar, please use the dropdown menu above to the right of your screen. For calendars prior to the 2015-2016 Academic Calendar, please [click here](#)

About this Calendar

This online calendar (acalog™) contains a number of features that can assist you with your academic planning. Some of these features include:

1. Advanced, easy-to-use search options
2. Intuitive navigation
3. Printable Degree Planners
4. Personal Portfolio to store favourite programs, courses and pages
5. Print-friendly pages

For information on how to use these features, please see our [FEAS Calendar User Guide](#) .

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Glossary

Academic Plan

A specified combination of courses leading to a degree in a particular subject.

Academic Program

Refers to the degree program of study that a student is pursuing, i.e., Bachelor of Applied Science or special programs such as UASC, UBUS, UEDU.

Associate Dean (Academic)

In charge of undergraduate studies for the Faculty.

AU

Academic Units, numerically equal to CEAB Accreditation Units.

Board of Trustees

The senior administrative body of the University.

BTech

Bachelor of Mining Engineering Technology

Bursary

Financial award for a student in need.

Calendar

An official publication of academic regulations, plans of study, descriptions of courses of instruction, and requirements for graduation.

CEAB

Canadian Engineering Accreditation Board.

CS: Complementary Studies

Topics in Engineering Economics, Communications, Management, Humanities and Social Sciences, Linkage and Professional Issues, and Performance Arts and Languages.

Confidential Examination

An examination paper recovered after the examination and withheld from circulation or publication.

Core

Those courses which are a mandatory part of an academic plan.

Corequisites

Courses which must be taken at the same time as the course in question, or have previously been taken and passed.

Credit

To attribute to an academic record, the accreditation units for a similar course of instruction.

Dean

The Chief Executive Officer of the Faculty.

Department

A subdivision of the Faculty responsible for a particular subject or group of related subjects, or an academic plan.

ECGPA

Engineering Cumulative Grade Point Average - see Regulation 16c for definition.

EGGPA

Engineering Graduation Grade Point Average - see Regulation 16d for definition.

Electives

A group of courses from which a specified number must be chosen to satisfy part of the requirements for the degree.

Engineering Design

Development of elements, systems and processes using mathematics, science and engineering science to meet specific needs and constraints.

Engineering Science

Application of mathematics and basic sciences to the identification and solution of engineering problems.

Engineering Session

Defined as the Fall and Winter terms of the academic year, provided the student is registered in the FEAS for both of these sessions.

Engineering student

A student registered in the FEAS.

ESGPA

Engineering Sessional Grade Point Average - see Regulation 16b for definition.

Exemption

A required course replaced in an academic plan by relevant Work Experience plus an equivalent number of Accreditation Units extra to the academic plan approved by the Operations Committee.

Extended Program

An extension of Year One into the spring term allowing more time for the study of mathematics, chemistry and physics to assist first year students having difficulties in those subjects.

Faculty Board

The Committee charged with overseeing all academic matters in the Faculty.

FEAS

Faculty of Engineering and Applied Science.

GPA

Grade Point Average - see Regulation 16a for definition.

H & SS

Humanities and Social Sciences.

IAESTE

International Association for the Exchange of Students for Technical Experience.

Internship

A twelve or sixteen month period in industry, arranged by the University, for academic credit.

Letter of Permission

A formal document allowing a student to take a course at another institution in lieu of one in the student's regular academic plan.

Natural Sciences

Physics, Chemistry, Earth and Life Sciences.

Operations Committee

A standing committee of Faculty Board which deals with Admissions, Scholarships, Academic Progress, and Curriculum matters.

P.Eng.

Professional Engineer, registered by a Provincial licensing authority.

PEO

Professional Engineers Ontario: The licensing authority in Ontario.

Prerequisites

Courses which must be passed before the course in question can be taken.

Principal

The Chief Executive Officer of the University.

Prior Learning Assessment (PLA)

Challenge Examinations in First Year Subjects.

QUIP

Queen's Undergraduate Internship Program.

Reading Week

A period in which classes are suspended in favour of independent study.

Regular Session

A Regular Session normally consists of the Fall and Winter terms of instruction. In the case of first year students registered in the Extended Program, the Regular Session includes the Spring term.

Regulations

The rules established by the Faculty Board and by the Senate by which a student's academic progress and department are governed.

Reread

The reassessment of a student's final paper in a course, on appeal.

SAL

Student Assistance Levy.

Scholarship

A financial award based on academic merit.

Senate

The University's senior academic board.

SOLUS

Student On-Line University System

Sub-plan

One of two or more streams within an academic plan: eg., the Chemical Process Sub-plan in Chemical Engineering.

Substitution

Replacement of a required course, stipulated in the calendar, by another course, with the approval of the Operations Committee.

SURP

School of Urban and Regional Planning.

Term

A period of instruction, usually of 12 weeks duration.

Transcript

A document provided by the Registrar's Office that lists the entire academic record-to-date of a student in the University. An Official Transcript is certified by the Registrar.

Transfer Credit

Credit allowed for a course taken in another Faculty or at another institution.

Withdrawal

A formal process for discontinuing studies in a course or in an academic plan.

Important Dates

Dates apply to the Fall-Winter academic year beginning in September 2017. See Sessional Dates for a complete list.

Registration	10-28 July	Course Selection Window. Enrolment Appointment will appear in students SOLUS Student Centre beginning July 2nd
	22 August	Time period to add and drop classes begins (Open Enrolment)
	1 Sept	Tuition payment for Fall term due
	10 January	Tuition payment for Winter term due
Orientation Week	3 - 8 Sept.	
Late Registration		<ul style="list-style-type: none">a. After 22 September, students must submit a written appeal for late registration to the Operations Committee. If the appeal is granted, the late fee will applyb. After 1 November (after 1 Feb-winter term) no more registrations are accepted.
Classes Begin and End	Fall: 11 Sept	Classes begin
	1 December	Classes end
	Winter: 8 January	Classes begin
	6 April	Classes end

	Summer (May-June session): 1 May	Classes begin
	18 June	Classes end
	Summer (May-July session): 1 May	Classes begin
	27 July	Classes end
	Summer (July-August session): 3 July	Classes begin
	13 August	Classes end

Adding and Dropping Courses

Beginning 1 September, students can add and drop courses on SOLUS. The Chair of Undergraduate Studies in the specific academic plan must be advised when a course is dropped. Verbal requests to course instructors and/or absence from class are not sufficient and usually result in failure and loss of fee refund.

Adding	22 September	Last date to add Fall Term courses and Fall-Winter courses.
	19 January	Last date to add Winter Term courses.
	11 May	Last date to add Summer Term (May-June and May-July session) courses.
	9 July	Last date to add Summer Term (July-August session) courses.
Dropping	Fall: 22 Sept	Last date to drop Fall Term courses without financial penalty
	Fall-Winter: 22 Sept	Last date to drop Fall-Winter courses without financial penalty
	Winter: 19 Jan	Last date to drop Winter Term courses without financial penalty
	Summer (May-June): 11 May	Last date to drop Summer Term (May-June) courses without financial penalty

	Summer (May-July): 18 May	Last date to drop Summer Term (May-July) courses without financial penalty
Complete Withdrawal from the University	22 September (January 19 for the winter term)	Last date to withdraw and obtain a full refund **
	19 January	Last date to withdraw from academic plan without failed year.
Student and Bus-It cards must be returned for full or partial refunds of student interest fees.		
Reading Week	20-23 February	
	1 March	Academic Plan Selection for First Year Students Deadline
Exam Dates	Fall: 7-21 December	
	Winter: 12-26 April	
	Summer (May-June): 21-22 June	
	Summer (May-July): 31 July	
	Summer (July-August): 15-16 August	
Convocation	Fall	TBA
	Spring	TBA

Pre-registration 2018	Get "Appointment Date" (pre-registration start date & time) from SOLUS beginning of July. Select courses on SOLUS from "Appointment Date" start date & time until end of pre-registration period.
** Information on late registration fees, refunds, and fees in general is provided in the Guide to Registration and Fees issued by the Registrar's Office. Fees information is also available at http://queensu.ca/registrar/financials/tuition-fees	

Dates for Extended Program for Section 900 Courses		
15	January	Extended Program classes begin for Fall courses.
22	January	Last day to add a Fall Extended Program course.
26	January	Last day to drop a Fall Extended Program course.
20-23	February	Extended Program Fall course examinations.
26	February	Extended Program classes begin for Winter courses.
1	March	Last day to add/drop APSC 151 and/or APSC 161 rewrite examination.
2	March	Last day to drop a Regular Academic Plan Winter term course.
6	April	Last day to add a Winter Extended Program course.
9	April	Last day to drop a Winter Extended Program course.
1	May	Extended Program fees due.
2	May	Extended Program Spring term begins.
8	June	Extended Program classes end.
11-15	June	Extended Program Winter course examinations.

Sessional Dates

FEE DEADLINES: Fee deadlines are not listed in the Sessional Dates, and do not necessarily correspond with academic deadlines. Information on deadlines for dropping courses without financial penalty is contained in the Guide to Registration and Fees available from the Office of the University Registrar on the web at <http://www.queensu.ca/registrar/currentstudents/fees.html>

EXAMINATION REREADING DEADLINES: The attention of students is drawn to Regulation 13 concerning deadlines for making application to reread examination papers.

May 2017

- 1 Summer Term begins
- 1 Tuition fees due in full for all Summer Term Sessions
- 1 Summer Term classes begin (May-June and May-July sessions)
- 1 Extended Program Fees are due
- 1 Last day for student consultations regarding Dual Degree application
- 1 Extended Program Spring Term begins
- 5 Last date to add Summer Term classes (May-June and May-July sessions)
- 5 Last date to drop Summer Term classes (May-June session) without financial penalty
- 12 Last date to drop Summer Term classes (May-July session) without financial penalty
- 22 Victoria Day (classes will not be held)
- 19 Last day for eligible students in the regular First Year program to register to rewrite the exam for Winter First Year courses (APSC 112, APSC 132, APSC 172, and APSC 174)
- 26 Last day to pay administrative fee for rewrite exams in Winter Term courses of the First Year program that are written in a location other than Kingston
- 26 Last date to drop Summer Term classes (May-June session)

June 2017

NOTE: Spring 2017 Convocation dates will be published by the Office of the University Registrar in November 2016. Refer to <http://www.queensu.ca/registrar/convocation/ceremonies> to view these dates.

- 1 Last day to apply for Dual Degree Program for the next Fall-Winter session
- 2 Last day to withdraw from rewrite exams for Winter Term First Year courses
- 9 Extended Program classes end
- 12 Summer Term classes end (May-June session)
- 15 Last day to apply for supplemental examination privileges
- 12-16 Extended Program Winter course examinations
- 15-16 Summer Term examination period (TENTATIVE) (May-June session)
- 23 Last date to drop Summer Term classes (May-July session)

July 2017

- 1 Tuition fees due in full for Summer Term classes (July-August session).
- 3 Canada Day Holiday (University closed. Classes will not be held)
- 4 Summer Term classes begin (July-August session).
- 10 Last date to add Summer term classes (July-August session).
- 10 Last date to drop Summer term classes (July-August session) without financial penalty.
- 15 Last day to apply for readmission for students who voluntarily withdrew or who were required to withdraw prior to 2017
- 15 First day to apply to graduate for Fall 2017 Degree List (tentative).
- 21 Summer Term classes end (May-July Session).
- 25-28 Summer Term examination period (TENTATIVE) (May-July session)
- 31 Last date to drop Summer Term classes (July-August session).
- 31 Last date to apply for admission to the Upper-Year program at the Bader International Study Centre for Fall term.

August 2017

- 7 Civic Holiday (University closed. Classes will not be held).
- 14 Summer Term classes end (July-August session).
- 15 Last day to cancel application for supplemental examinations without academic or financial penalty
- 16-17 Summer Term examination period (TENTATIVE) (July-August session)
- 22 Time period to add and drop classes in SOLUS begins (open enrolment).
- 31 Summer Term ends.

September 2017

- 1 Fall Term begins.
- 1 Tuition fees due in full for Fall Term.
- 3 Orientation Week begins (arrival day)
- 3 Welcoming Ceremony for new students
- 4 Labour Day (University closed. Classes will not be held)
- 6-8 Supplemental examinations
- 11 Fall Term classes begin

15 Last date to apply for an academic plan change from one plan in Engineering to another plan in Engineering for the Fall term.

22 Last date to drop Fall Term and Fall-Winter session course without financial penalty.

22 Last day to register without extra fee. After this date, students must appeal in writing to the Operations Committee for permission to register late

22 Last day to add a Fall term course or a Fall-Winter sessional course

30 Deadline for payment of residence, UHIP and student activity fees

30 Last day to apply to graduate for Fall 2017 Degree List (tentative)

October 2017

9 Thanksgiving Day (University closed. Classes will not be held)

16 University Day (Classes will be held)

November 2017

NOTE: Fall 2017 Convocation Dates will be published by the Office of the University Registrar in May 2017. Refer to <http://www.queensu.ca/registrar/convocation/ceremonies> to view these dates.

3 Last day to drop a Fall Term course without academic penalty

7 Last date to apply for accommodation for an official examination conflict for the December examination period.

10 Remembrance Day (Classes cancelled 10:30-11:30 a.m.)

15 Last date to apply for admission to the Upper-Year program at the Bader International Study Centre for Winter term.

TBA Fall Convocation (TENTATIVE)

December 2017

1 Last day to apply for admission to Dual Degree in Arts and Science for the next Winter Term

1 First day to apply to graduate for Spring 2018 Degree List (tentative)

1 Fall Term classes end

2-5 Fall Term pre-examination study period

6 Commemoration Day (All academic activity with the exception of clinical and field work will be cancelled)

7-21 Fall Term examination period

31 Fall Term ends

January 2018

- 1 New Year's Day (University closed. Classes will not be held)
- 1 Winter Term begins
- 8 Winter Term classes begin
- 10 Tuition Fees due in full for Winter term
- 12 Last date to apply for an academic plan change from one plan in Engineering to another plan in Engineering for the Winter term.
- 15 Extended Program classes begin for APSC 111 , APSC 131 , and APSC 171
- 19 Last date to drop a Winter Term course without financial penalty.
- 19 Last day to add a Winter Term course.
- 19 Last day to withdraw from degree program without failure of year
- 13 Last day to apply to rewrite a First Year Fall course examination (APSC 111 , APSC 131 , and APSC 171) which take place in February Reading Week
- 17 Academic Plan (Discipline) Orientation for First Year Students begins
- 22 Last day to cancel an application to rewrite a First Year Fall course examination without academic penalty
- 22 Last day to add a Fall Extended Program course
- 26 Last day to drop a Fall Extended Program course
- 31 Last day to apply for the exchange program for 2018-2019 (tentative)

February 2018

- 5 Registration for Summer Term classes begins.
- TBA Last day to apply to graduate for Spring 2018 Degree List
- 5 Academic Plan Selection for First Year Students begins on SOLUS (tentative)
- 16 Extended Program Fall Term ends
- 19 Family Day (University closed. Classes will not be held)
- 20-23 Extended Program Fall course examinations
- 20-23 Reading Week (Classes will not be held)
- 26 Extended Program Classes begin for APSC 112, APSC 132, APSC 172, and APSC 174

March 2018

- 1 Academic Plan Selection for First Year Students ends on SOLUS
- 1 Last day to add APSC 151 and/or APSC 161 rewrite examination in April

- 1 Last day to drop APSC 151 and/or APSC 161 rewrite examination in April
- 2 Last day to drop a Winter Term and Fall-Winter course without academic penalty
- 7 Last date to apply for accommodation for an official examination conflict for the April examination period.
- 30 Good Friday (University closed. Classes will not be held)
- 30 Last day to apply for admission to upper year courses at the International Study Centre for Spring-Summer session

April 2018

- 1 Last day to apply for admission to Dual Degree in Arts and Science for the Summer Term
- 6 Winter term classes end
- 6 Last day to add a Winter Extended Program course (with permission of the Associate Dean (Academic))
- 9 Last day to drop a Winter Extended Program course
- 7-11 Winter Term pre-examination study period
- 12-26 Winter Term examination period
- 30 Winter Term ends

May 2018

- 1 Summer Term begins
- 1 Tuition fees due in full for all Summer Term Sessions
- 1 Extended Program Fees are due
- 2 Extended Program Spring Term begins
- 7 Summer Term Classes begin (May-June and May-July sessions)
- 11 Last date to add Summer Term classes (May-June and May-July sessions)
- 11 Last date to drop Summer Term classes (May-June session) without financial penalty
- 18 Last date to drop Summer Term classes (May-July session) without financial penalty
- 21 Victoria Day (University closed. Classes will not be held)
- 18 Last day for eligible students in the regular First Year program to register to rewrite exams for Winter First Year courses (APSC 112, APSC 132, APSC 172, and APSC 174)
- 25 Last day to pay administrative fee for rewrite exams in Winter Term courses of the First Year program that are written in a location other than Kingston

June 2018

NOTE: Spring 2018 Convocation dates will be published by the Office of the University Registrar in November 2017. Refer to <http://www.queensu.ca/registrar/convocation/ceremonies> to view these dates.

- 1 Last date to drop Summer Term classes (May-June session)
- 1 Last day to apply for Dual Degree Program for the next Fall-Winter session
- 1 Last day to withdraw from rewrite exams for Winter First Year courses
- 8 Extended Program classes end
- 11-15 Extended Program Winter course examinations
- 15 Last day to apply for supplemental examination privileges
- 18 Summer Term classes end (May-June session)
- 21-22 Summer Term examination period (TENTATIVE) (May-June session)
- 29 Last date to drop Summer Term classes (May-July session)

July 2018

- 1 Tuition fees due in full for Summer Term classes (July-August session)
- 1 Canada Day (University closed. Classes will not be held)
- 3 Summer Term classes begin (July-August session)
- 9 Last date to add Summer Term classes (July-August session)
- 9 Last date to drop Summer Term classes (July-August session) without financial penalty
- 9-27 Summer class selection period (TENTATIVE)
- 27 Summer Term classes (May-July session) end
- 30 Last date to drop Summer Term classes (July-August session)
- 31 Summer Term examination period (TENTATIVE) (May-July session)
- 31 Last date to apply for admission to the Upper-Year program at the Bader International Study Centre for Fall term.

August 2018

- 3 Summer Term Examinations in May-July Session classes (Tentative)
- 6 Civic Holiday (University closed. Classes will not be held)
- 13 Summer Term classes end (July-August Session).
- 15-16 Summer Term examination period (TENTATIVE) (July-August session)
- 17 Last day to cancel application for supplemental examinations without academic or financial penalty

21 Time period to add and drop classes (open enrolment period) begins (Tentative)

31 Summer Term ends

September 2018

NOTE: Academic Calendar dates for 2018-2019 are under Senate review and will be available in October 2017.

***Please note:** Faith Dates are not included in the Academic Calendar. Please be aware of Faith Dates when coordinating any events in your department. For Faith Dates, please see the Human Rights web site at: <http://multifaithcalendar.org/cal/index.php>

Undergraduate Academic Plan

Structure and Definitions

The Faculty of Engineering and Applied Science offers degree programs in ten academic plans. Plans nominally of four years' duration lead to the degree of Bachelor of Applied Science in Engineering. Five-year plans, which include an Internship, lead to the degree of Bachelor of Applied Science in Engineering with Professional Internship. The codes for these plans and the prefix used throughout this Calendar for the courses in those disciplines are given below. **The First Year is common to all academic plans.**

<i>Program</i>	<i>Program Code</i>	<i>Course Prefix</i>
Chemical Engineering	CHEE	CHEE
Civil Engineering	CIVL	CIVL
Computer Engineering	CMPE	SOFT, CMPE or ELEC
Electrical Engineering	ELEC	ELEC
Engineering Chemistry	ENCH	ENCH
Engineering Physics	ENPH	ENPH
Geological Engineering	GEOE	GEOE
Mathematics and Engineering	MTHE	MTHE
Mechanical Engineering	MECH	MECH
Mining Engineering	MINE	MINE

Faculty Courses		APSC
Multi-department Courses		MDEP

There are five major components to each of these academic plans:

MATHEMATICS: Elements of algebra, calculus, differential equations, probability, statistics and numerical analysis;

NATURAL SCIENCE: Elements of Physics and Chemistry, and in some plans, elements of Earth and Life Sciences;

COMPLEMENTARY STUDIES: Topics in Engineering Economics, Communications, Management, Humanities and Social Sciences, Linkage and Professional Issues, and Performance Arts and Languages. Engineering Sciences and Engineering Design constitute about half of the plan in each case, with the other components approximately equal to each other in weight.

ENGINEERING SCIENCE: Extension of Mathematics and Basic Sciences toward creative applications;

ENGINEERING DESIGN: The application of Mathematics, Science, and Engineering Science to meet specific needs; and

Program Accreditation and Licensing The licensing of engineers in Canada is a provincial and territorial matter. Bodies such as Professional Engineers Ontario (PEO) are established by statute to govern the profession. The Canadian Council of Professional Engineers (CCPE) is the national federation of these governing bodies. A standing committee of CCPE, the Canadian Engineering Accreditation Board (CEAB), is responsible for identifying those educational programs that meet the academic standards required for membership in the profession. From time to time the Faculty of Engineering and Applied Science submits its academic plans to the CEAB for review. All of the academic plans in the Faculty of Engineering and Applied Science are accredited by the CEAB.

Note: Effective May 1, 2011, the Faculty of Engineering and Applied Science moved each course weight from accreditation units (AU) to credit units. This means, for example, that instead of a weighting of 36 AU, a course will now count as 3 credits. In order to determine the new credit weighting for each course, the AU was divided by 12 and, if needed, rounded to the nearest quarter (0.25, 0.50 or 0.75).

Academic Plan and Course Symbols and Codes: Plans are identified by a four-letter code (see table above). Courses are identified by:- a four letter code and a three digit number (the first of which identifies the year of the plan in which the course would normally be taken - i.e. 174 is a year one course); - a title; - a letter or letters indicating the term (F=Fall, W=Winter, FW=Fall **AND** Winter, F/W=Fall **OR** Winter, S=Summer, N/O=Not Offered);- a series of numbers indicating the units assigned to lectures (1 credit = one 50 minute lecture) and to laboratory assignments, tutorial, and significant project work (0.5 credits = one hour).

For example, the codes for a typical entry are:

- APSC 174 Introduction to Linear Algebra W | 3.3

This is a Faculty course normally taken in the first year. It is offered in the Winter term, will have 36 fifty-minute lectures (3 lectures per week); no lab; twelve hours in tutorials (one hour per week). The final number is the sum of the accreditation units, and represents the weight of the course. A section on Course Descriptions appears elsewhere in this Calendar.

Requirements for Graduation The minimum number of Accreditation Units required for graduation is stipulated for each of the academic plans in the Faculty. These minimum form part of the curriculum of each plan as described later in the Degree Program section of this Calendar. The minimum number varies from plan to plan, but in the current year all are greater than 1950 AU.

Minimum Requirements for CEAB Accreditation

The Canadian Engineering Accreditation Board (CEAB) requires all that all graduates from accredited engineering programs have Academic Units (AUs) at the time of graduation which meet ALL the following conditions 1-3:

1. Minimum AUs in the following five categories:

M	195AU	Mathematics
NS	195AU	Natural Science
CS	225AU	Complementary Studies
ES	225AU	Engineering Science
ED	225AU	Engineering Design

2. The sum of the AUs in these five categories shown above must be at least **1950 AUs**.
3. Two sums of categories must also meet minimum requirements as shown below e.g. the sum of AUs in Mathematics and Natural Sciences must be at least 420 AU, and the sum of AUs in Engineering Science and Engineering Design must be at least 900 AU:

M+NS	420AU	Mathematics(195 AUs or more) + Natural Science (195 AUs or more)
ES+ED	900AU	Engineering Science (225 AUs or more) + Engineering Design (225 AUs or more)

4. Within the broad five categories, it is expected that time will be spent on such topics as safety procedures, public and worker safety, ethics, equity, and concepts of sustainable development and of environmental stewardship.

The number of AUs in each of the five categories is listed at the end of each course description in the calendar (provide a link to the calendar). The AUs are listed in the format of (M/NS/CS/ES/ED). For example:

- MECH 230 Thermodynamics I F | 3.5

An introductory course in thermodynamics. Topics include: properties and behaviour of pure substances, concepts of heat, work and energy, the First and Second Laws of Thermodynamics, and the analysis of a variety of power and refrigeration cycles. (0/33/0/9/0)

The numbers in parentheses at the end of the course description are the AUs. This course has 0 Math AUs, 33 Natural Science AUs, 0 Complementary Studies AUs, 9 Engineering Science AUs, and 0 Engineering Design AUs.

This course involves three lectures hours and one tutorial hour per week for the twelve weeks of the Fall term and therefore is assigned a weight of 3.5 credits which equates to 42 (AU) accreditation units. Of these, 33 units deal with topics in the Basic Sciences, and 9 are in Engineering Science. The course contains no Mathematics per se, no Complementary Studies, and no Engineering Design.

Proficiency Test in Written English

Students in all academic plans are required to demonstrate the ability to communicate effectively in written English. Within their first term, students registering in the Faculty for the first time must attempt a written English Proficiency Test. Students who do not pass on the initial attempt will have further opportunities, and

may need to pass the test or an equivalent test to meet the prerequisite for further instruction in communication required by the program. A student must pass the English Proficiency Test or an equivalent test, approved by the Associate Dean (Academic), to be eligible for graduation. Students may take advantage of the Faculty's English Support for Engineers program, and programs offered by the Writing Centre (<http://sass.queensu.ca/writingcentre/>).

Dual Degrees

Dual degrees are offered by the Faculty of Arts and Science can be taken concurrently with a degree in Engineering and Applied Science. Students must apply for admission through the Admission Services Office after one year at Queen's. To be accepted into a Dual Degree program in Engineering and Applied Science, you must have a minimum cumulative GPA of 2.60 or higher. The application deadline for summer term entry is **1 April**, fall term entry is **1 June** and for winter term entry is **1 December**. Candidates must have completed at least one year of study in their current academic plan and must be in good academic standing. Dual Degree programs will normally take at least five years of study, although some combinations of programs will be longer. Usually the path to be followed is intricate and requires the advisement of the Dual Degree Coordinator in the Engineering and Applied Science program. Dual Degree students share 60.0 units from their Engineering degree with their Arts and Science degree. Students must register in additional courses required for their 2nd degree and these additional courses must all be completed at Queen's. Fees for courses registered under the Arts and Science degree will be assessed according to the Faculty of Arts and Science. Further information can be found at <http://engineering.queensu.ca/Undergraduate-Programs/Dual-Degrees/index.html>

Integrated Learning

Director: Kim Woodhouse

NSERC Chair in Design Engineering: David Strong

Operations Manager: Simon Smith

Student Services, Faculty of Engineering and Applied Science: Room 300

Telephone (613) 533 6772

Fax Number (613) 533 2721

E-mail Address: ilc@queensu.ca

Web Site: <http://engineering.queensu.ca/Integrated-Learning-Center/>

Beamish-Munro Hall is the home of Integrated Learning, a focus for undergraduate engineering activities at Queen's. This multidisciplinary learning environment has been designed to support problem-based, project-based learning, enhancing design, team and professional skills development. Information on Integrated Learning may be found on the web site, <http://engineering.queensu.ca/Integrated-Learning-Center/>. Those wishing more information are invited to visit Beamish-Munro Hall, to telephone (613) 533 2055, or to write to ilc@queensu.ca.

Professional Internship Program

The Professional Internship Program allows qualified students the opportunity to pursue career related positions for 12 or 16 months after completion of their second or third year of study at Queen's. (This program is available to students in all programs in the Faculty.)

Employers request applications from third year students more frequently than from second year students, but internships have been arranged for both. Job openings under this program are posted by Career Services throughout the year.

In addition to the industrial experience for which the intern earns a salary, the Program includes prior workshops on resume preparation, interviewing, work performance, and employer expectations. Successful

completion of the program requires submission of a formal report or presentation, and a satisfactory assessment of the intern's performance by the Employer. Up to twelve months of the work may meet the criteria for professional work experience required for licensure as a Professional Engineer in Canada.

The 12-month program requires registration in three courses, and the 16-month program requires registration in four courses - each course is 1-term in duration. These are: APSC 301 , APSC 302 , APSC 303 , and APSC 304 . There is a special academic fee for these courses. (See the section on Fees in this Calendar.)

Details on the Internship Program can be obtained from the Career Services Office in Gordon Hall, and from their website at <http://careers.queensu.ca/>. The Engineering and Applied Science Internship Coordinator is George Sweetman, sweetmng@queensu.ca.

University Exchange Programs

The Faculty of Engineering and Applied Science offers student exchanges with other universities around the world. An exchange student can spend one year (two terms or one term) at the host university in a program approved by the Department and the Operations Committee. In most instances the student can satisfy the requirements for graduation from Queen's in the usual four-year time frame. Details on these programs and a list of the host institutions can be found at <http://engineering.queensu.ca/Undergraduate-Programs/Exchange-Programs.html> Details on the IAESTE program can be obtained from the Queen's University International Centre, John Deutsch University Centre.

Non-academic Student Services and Resources

Information on the services and resources available to students at Queen's, such as housing, medical services, and student activities, can be found on the Dean of Student Affairs web page at <http://www.queensu.ca/studentaffairs/departments.html>, or the Faculty general web address at <http://engineering.queensu.ca/>. The services of the Engineering Society are listed at <http://engsoc.queensu.ca>.

First Year Studies

First Year Studies, B.A.Sc.

The first year of study in Engineering and Applied Science is based on a common curriculum and serves as an introduction to all of the academic plans offered by the Faculty. The choice of academic plan the student intends to follow in the second and subsequent years is made in February in the Winter Term of the first year.

Electrical and Computer Engineering Innovation (ECEi) Stream

This program is intended for students with an interest in innovation and entrepreneurship who want to enter electrical or computer engineering in first year. The ECEi focuses on developing entrepreneurial skills alongside the technical and professional elements that are the hallmark of Queen's Engineering.

In the first year of the program students will take broad fundamental courses in math, science, and professional skills supplemented by an entrepreneurial design project specifically designed with for ECEi students. At the end of first year students choose between electrical or computer engineering, and develop strong technical fundamentals and skills necessary for innovation including economics and business practices, design and creativity, and teamwork.

Details about these stream are listed in the calendar at Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2020) and Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2020)

First Year Curriculum

- APSC 100 Engineering Practice I FW | K9
- APSC 111 Physics I F | 3.3
- APSC 131 Chemistry and Materials F | 3.3
- APSC 143 Introduction to Computer Programming for Engineers F | 3.3
- APSC 151 Engineering Geology and the Biosphere F | 3.3
- APSC 112 Physics II W | 3.3
- APSC 132 Chemistry and its Applications W | 3.3
- APSC 162 Engineering Graphics W | 2.5
- APSC 171 Calculus I F | 3.3
- APSC 172 Calculus II W | 3.3
- APSC 174 Introduction to Linear Algebra W | 3.3
- APSC 182 Applied Engineering Mechanics W | 1.7

Minimum Total Credits: 42.9

First Year Advice and Counseling

First Year students looking for academic advice and counseling are encouraged to contact the Program Associate, Student Services, Faculty of Engineering and Applied Science by phone at 533-2055 or by email at engineering.first.year@queensu.ca.

The Douglas Tutorials

A gift from Dr. James Douglas (Queen's BA, 1858) in 1910 made possible the establishment of a program by which First Year students are tutored by students selected from senior years. Details are available in the Faculty Office, and on the web at <http://engineering.queensu.ca/Current-Students/First-Year-Studies/DouglasTutorials.html>

The EngSoc Engvents

The EngSoc Engvents The Engvents Committee's mandate is to connect engineering students of all years and disciplines through team based competitions and social events hosted throughout the year. Past events have included paintballing, dodgeball tournaments, bowling nights, amazing race style scavenger hunts, and even a Boat Cruise on Lake Ontario! So come on out, connect with fellow engineers, and have a great time with Engvents! If you have any questions or would like to get involved with Engvents, contact engvents@engsoc.queensu.ca.

The EngSoc 'EngLink' System

For help using the EngSoc 'EngLink' system, see <http://englinks.ca/>

The Extended Program

The Extended Program provides an opportunity for First Year students who experience difficulties with the introductory courses APSC 111, APSC 131, and/or APSC 171 in the fall semester to retake these courses in the winter semester. Registration in the Extended Program takes place in early January. The courses normally completed in December are reviewed, and final examinations are rewritten in February during Reading Week. Instruction in the second term courses in APSC 112, APSC 132, APSC 172 and APSC 174 begins after Reading Week, is suspended when regular Winter term lectures end, and resumes after the normal examination period. These second term courses are completed in June. There is a special fee for each course in the Spring term (see the Section on Fees) *

Orientation Nights

In late January and early February each department holds an Orientation Night for first year students to introduce them to the department and to its academic plan(s). Students are encouraged to attend as many of these evening seminars as possible to help them make their plan choice. Help in reaching a decision regarding future studies can also be obtained in private discussions with upper year students, instructors, and the Program Associate, Student Services in the Faculty Office. Help is available on web pages maintained by the departments in the Faculty (see <http://engineering.queensu.ca/Current-Students/First-Year-Studies/DisciplineOrientationSchedule.html>).

Choice of Program: Preregistration

First year students preregister in February to indicate the academic plan in which they intend to register in the academic year. A student will be admitted to the plan of their choice, provided the first year requirements have been met. Having preregistered in one plan, it may be possible to apply to transfer to another at a later date. However, such a change must be approved, in advance, by the department offering the academic plan in which the student wishes to register.

Admission to a Second Year Program

The rules governing the admission to the second year are given in the Faculty Regulations Section: in particular, Regulations 2b, 2f, 2g, and 10. Briefly, if a student has passed all of the courses in the First Year plan with marks of 1.6 ECGPA or better, admission to the second year will be unconditional. Otherwise, there may be constraints. Advice should be sought from the Faculty Office, or from the Chair of Undergraduate Studies in the program of choice.

Academic Plans

First Year, Engineering and Applied Science

First Year Studies, B.A.Sc.

The first year of study in Engineering and Applied Science is based on a common curriculum and serves as an introduction to all of the academic plans offered by the Faculty. The choice of academic plan the student intends to follow in the second and subsequent years is made in February in the Winter Term of the first year.

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This program is intended for students with an interest in innovation and entrepreneurship who want to enter electrical or computer engineering in first year. The ECEi focuses on developing entrepreneurial skills alongside the technical and professional elements that are the hallmark of Queen's Engineering.

In the first year of the program students will take broad fundamental courses in math, science, and professional skills supplemented by an entrepreneurial design project specifically designed with for ECEi students. At the end of first year students choose between electrical or computer engineering, and develop strong technical fundamentals and skills necessary for innovation including economics and business practices, design and creativity, and teamwork.

Details about these stream are listed in the calendar at Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2020) and Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2020)

First Year Curriculum

- APSC 100 Engineering Practice I FW | K9
- APSC 111 Physics I F | 3.3
- APSC 131 Chemistry and Materials F | 3.3
- APSC 143 Introduction to Computer Programming for Engineers F | 3.3
- APSC 151 Engineering Geology and the Biosphere F | 3.3
- APSC 112 Physics II W | 3.3
- APSC 132 Chemistry and its Applications W | 3.3
- APSC 162 Engineering Graphics W | 2.5
- APSC 171 Calculus I F | 3.3
- APSC 172 Calculus II W | 3.3
- APSC 174 Introduction to Linear Algebra W | 3.3
- APSC 182 Applied Engineering Mechanics W | 1.7

Minimum Total Credits: 42.9

First Year Advice and Counseling

First Year students looking for academic advice and counseling are encouraged to contact the Program Associate, Student Services, Faculty of Engineering and Applied Science by phone at 533-2055 or by email at engineering.first.year@queensu.ca.

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The EngSoc Engvents

The EngSoc Engvents The Engvents Committee's mandate is to connect engineering students of all years and disciplines through team based competitions and social events hosted throughout the year. Past events have included paintballing, dodgeball tournaments, bowling nights, amazing race style scavenger hunts, and even a Boat Cruise on Lake Ontario! So come on out, connect with fellow engineers, and have a great time

with Engvents! If you have any questions or would like to get involved with Engvents, contact engvents@engsoc.queensu.ca.

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The Extended Program

The Extended Program provides an opportunity for First Year students who experience difficulties with the introductory courses APSC 111, APSC 131, and/or APSC 171 in the fall semester to retake these courses in the winter semester. Registration in the Extended Program takes place in early January. The courses normally completed in December are reviewed, and final examinations are rewritten in February during Reading Week. Instruction in the second term courses in APSC 112, APSC 132, APSC 172 and APSC 174 begins after Reading Week, is suspended when regular Winter term lectures end, and resumes after the normal examination period. These second term courses are completed in June. There is a special fee for each course in the Spring term (see the Section on Fees) *

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In late January and early February each department holds an Orientation Night for first year students to introduce them to the department and to its academic plan(s). Students are encouraged to attend as many of these evening seminars as possible to help them make their plan choice. Help in reaching a decision regarding future studies can also be obtained in private discussions with upper year students, instructors, and the Program Associate, Student Services in the Faculty Office. Help is available on web pages maintained by the departments in the Faculty (see <http://engineering.queensu.ca/Current-Students/First-Year-Studies/DisciplineOrientationSchedule.html>).

Choice of Program: Preregistration

First year students preregister in February to indicate the academic plan in which they intend to register in the academic year. A student will be admitted to the plan of their choice, provided the first year requirements have been met. Having preregistered in one plan, it may be possible to apply to transfer to another at a later date. However, such a change must be approved, in advance, by the department offering the academic plan in which the student wishes to register.

Admission to a Second Year Program

The rules governing the admission to the second year are given in the Faculty Regulations Section: in particular, Regulations 2b, 2f, 2g, and 10. Briefly, if a student has passed all of the courses in the First Year plan with marks of 1.6 ECGPA or better, admission to the second year will be unconditional. Otherwise, there may be constraints. Advice should be sought from the Faculty Office, or from the Chair of Undergraduate Studies in the program of choice.

Chemical Engineering

Department Head P.J. McLellan

Undergraduate Chair M. Guay

Undergraduate Assistant L.D. Joannette

Office Dupuis Hall, Room 205

Telephone (613) 533-6000 Ext. 74829
E-mail undergrad@chee.queensu.ca
Departmental Web Site <http://www.chemeng.queensu.ca>

The Chemical Engineering academic plan provides students with a versatile engineering experience based on fundamental sciences, mathematics, and engineering science, combined with engineering design. Students may elect to pursue the Chemical Process Engineering Sub-plan (CHE1) or the Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-plan (CHE2). In addition to the technical content of the plan, students are introduced to business skills (engineering communication and ethics, innovation and entrepreneurship, process economics and project management) and acquire laboratory experience in state-of-the-art facilities. Group-based design projects are offered throughout the design spine. In their fourth year students select client-based industrial consulting projects, or research projects under the supervision of academic staff or professional engineers. All students have access to a computing facility, equipped with software programs and simulators.

Ancillary Fees

Chemical Engineering and Engineering Chemistry students may be required to pay ancillary fees for course related learning materials, safety equipment and field trips.

(CHE1) Chemical Engineering - Chemical Process Engineering Sub-Plan, B.A.Sc.(Class of 2018)

Second Year CORE 2015-2016

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 224 Transport Phenomena Fundamentals F | 3
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Units: 44.25

Third Year CORE 2016-2017

- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5

- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- Elective Complementary Studies List A, B, C or D (3 credits) F/W| 3¹
- Elective Technical Electives (min 3 credits) F/W| 3¹

Minimum Total Units: 43.5

¹ Electives can be taken in either the fall or winter terms, but recommend taking in winter term to maintain a balanced course load.

Fourth Year CORE 2017-2018

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- CHEE 412 Transport Phenomena W | 3.5
- ELECTIVE Technical Elective (minimum 6 credits) F/W | 6
- ELECTIVE Complementary Studies List A, B, C or D (6 credits) F/W | 6

Plus Two Of:

- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 400 Technology, Engineering & Management (TEAM) FW | K7
OR
- CHEE 421 Research Project FW | K 7
OR
- CHEE 420 Laboratory Projects III F/W | K 4 Plus a TECH Elective from either Group A or Group B¹
OR
- MINE 458 Process Investigations W | 4 Plus a TECH Elective from either Group A or Group B²

Minimum Total Credits: 40

¹ CHEE 420 and a TECH elective from either Group A or Group B count together as one choice.

² MINE 458 and a TECH elective from either Group A or Group B count together as one choice.

Technical Electives

Students in the Process Engineering Sub-plan (CHE1) must take a minimum of nine (9) credits in technical electives of which a minimum of three (3) credits must be from the CHE1 Group A technical electives list and the remaining six (6) credits from either the CHE1 Group A or Group B technical electives list.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose 9 credits from the approved Lists A, B, C, or D of which 6 credits must be taken from List A. Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Economics

To meet the engineering economics requirement, students take CHEE 310 (this is a CORE course).

Communications

To meet the communications course requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

(CHE1) Chemical Engineering - Chemical Process Engineering Sub-Plan, B.A.Sc.(Class of 2019)

Second Year CORE 2016-2017

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 224 Transport Phenomena Fundamentals F | 3
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 44.25

Third Year CORE 2017-2018

- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5

- ELECTIVE Complementary Studies List A, B, C or D (3 Credits) F/W 3¹
- ELECTIVE Technical Elective (Minimum 3 Credits) F/W 3¹

Minimum Total Credits: 43.5

¹ Electives can be taken in either the fall or winter terms, but recommend taking in winter term to maintain a balanced course load.

Fourth Year CORE 2018-2019

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- CHEE 412 Transport Phenomena W | 3.5
- Elective Technical Elective (minimum 6 credits) F/W| 6
- Elective Complementary Studies List A, B, C, or D (6 credits) F/W| 6

Plus Two Of:

- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 400 Technology, Engineering & Management (TEAM) FW | K7
OR
- CHEE 421 Research Project FW | K 7
OR
- CHEE 420 Laboratory Projects III F/W | K 4 Plus a TECH Elective from either Group A or Group B¹
OR
- MINE 458 Process Investigations W | 4 Plus a TECH Elective from either Group A or Group B²

Minimum Total Credits: 40

¹ CHEE 420 and a TECH elective from either Group A or Group B count together as one choice.

² MINE 458 and a TECH elective from either Group A or Group B count together as one choice.

Technical Electives

Students in the Process Engineering Sub-plan (CHE1) must take a minimum of nine (9) credits in technical electives of which a minimum of three (3) credits must be from the CHE1 Group A technical electives list and the remaining six (6) credits from either the CHE1 Group A or Group B technical electives list.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose 9 credits from the approved Lists A, B, C, or D of which 6 credits must be taken from List A. Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Economics

To meet the engineering economics requirement, students take CHEE 310 (this is a CORE course).

Communications

To meet the communications course requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

(CHE1) Chemical Engineering - Chemical Process Engineering Sub-Plan, B.A.Sc. (Class of 2020)

Second Year CORE 2017-2018

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 224 Transport Phenomena Fundamentals F | 3
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Units: 44.25

Third Year CORE 2018-2019

- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE Technical Elective (Minimum 3 Credits) F/W 3¹
- ELECTIVE Complementary Studies List A, B, C or D (3 Credits) F/W¹

Minimum Total Units: 43.5

1 Electives can be taken in either the fall or winter terms, but recommend taking in winter term to maintain a balanced course load.

Fourth Year CORE 2019-2020

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- CHEE 412 Transport Phenomena W | 3.5
- ELECTIVE Technical Elective (minimum 6 credits) F/W | 6
- ELECTIVE Complementary Studies List A, B, C or D (6 credits) F/W | 6

Plus Two Of:

- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 400 Technology, Engineering & Management (TEAM) FW | K7
OR
- CHEE 421 Research Project FW | K 7
OR
- CHEE 420 Laboratory Projects III F/W | K 4 Plus a TECH Elective from either Group A or Group B¹
OR
- MINE 458 Process Investigations W | 4 Plus a TECH Elective from either Group A or Group B²

Minimum Total Credits: 40

¹*CHEE 420 and a TECH elective from either Group A or Group B count together as one choice.*

²*MINE 458 and a TECH elective from either Group A or Group B count together as one choice.*

Technical Electives

Students in the Process Engineering Sub-plan (CHE1) must take a minimum of nine (9) credits in technical electives of which a minimum of three (3) credits must be from the CHE1 Group A technical electives list and the remaining six (6) credits from either the CHE1 Group A or Group B technical electives list.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose 9 credits from the approved Lists A, B, C, or D of which 6 credits must be taken from List A. Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Economics

To meet the engineering economics requirement, students take CHEE 310 (this is a CORE course).

Communications

To meet the communications course requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

(CHE2) Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan, B.A.Sc. (2018)

Second Year CORE 2015-2016

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 229 Cell Based Engineering Principles F | 4
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 45.25

Third Year CORE 2016-2017

- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5²
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4¹
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 332 Design of Unit Operations W | K 4.5
- CHEE 340 Biomedical Engineering W | 3.5²
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE Complementary Studies List A, B D or D (3 Credits) F/W | 3³

Minimum Total Credits: 44

¹ CHE2 students are preloaded into the winter term of CHEE 315 to maintain a balanced course load, but can switch sections and/or terms with the instructor's permission.

² Depending on their interest in biomedical or environmental, CHE2 students may replace either CHEE 340 or CHEE 342, but not both, with a Group A TECH.

³ Electives can be taken in either the fall or winter term, but recommend taking electives in winter term to maintain a balanced course load

Fourth Year CORE 2017-2018

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- ELECTIVE Technical Elective (Minimum 9 Credits) F/W | 9
- ELECTIVE Complementary Studies, List A, B, C or D (6 Credits) F/W | 6

Plus One Of:

- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 400 Technology, Engineering & Management (TEAM) FW | K7
OR
- CHEE 408 Bioengineering Research Project FW | K7

Minimum Total Credits: 36

Technical Electives

Students in the Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-plan (CHE2) must take a minimum of 9 credits in technical electives. One (1) technical elective must be taken from the CHE1 Group A List and two (2) technical electives from the Group C list.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose 9 credits from the approved Lists A, B, C, or D of which 6 credits must be taken from List A. Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Economics

To meet the engineering economics requirement, students take CHEE 310 (this is a CORE course).

Communications

To meet the communications course requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

(CHE2) Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan, B.A.Sc. (2019)

Second Year CORE 2016-2017

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 229 Cell Based Engineering Principles F | 4
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 45.25

Third Year CORE 2017-2018

- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5 ¹
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 340 Biomedical Engineering W | 3.5 ¹
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE Complementary Studies List A, B D or D (3 Credits) F/W 3

Minimum Total Credits: 44

¹ Depending on their interest in biomedical or environmental, CHEE2 students may replace either CHEE 340 or CHEE 342, but not both, with a Group A TECH.

Fourth Year CORE 2018-2019

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- ELECTIVE Technical Elective (Minimum 9 Credits) F/W | 9
- ELECTIVE Complementary Studies, List A, B, C or D (6 Credits) F/W | 6

Plus One Of:

- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 400 Technology, Engineering & Management (TEAM) FW | K7
OR
- CHEE 408 Bioengineering Research Project FW | K7

Minimum Total Credits: 36

Technical Electives

Students in the Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-plan (CHE2) must take a minimum of 9 credits in technical electives. One (1) technical elective must be taken from the CHE1 Group A List and two (2) technical electives from the Group C list.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose 9 credits from the approved Lists A, B, C, or D of which 6 credits must be taken from List A. Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Economics

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Communications

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(CHE2) Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan B.A.Sc. (2020)

Second Year CORE 2017-2018

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- CHEE 229 Cell Based Engineering Principles F | 4
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 218 Laboratory Projects I W | 2.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5

- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 45.25

Third Year CORE 2018-2019

- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- CHEE 342 Environmental Biotechnology F | 3.5
- CHEE 380 Biochemical Engineering F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 340 Biomedical Engineering W | 3.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CHEE 371 Mitigation of Industrial Pollution W | 3.5
- ELECTIVE Complementary Studies List A, B D or D (3 Credits) F/W 3

Minimum Total Credits: 44

Fourth Year CORE 2019-2020

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 452 Transport Phenomena in Physiological Systems F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- ELECTIVE Technical Elective (Minimum 9 Credits) F/W | 9
- ELECTIVE Complementary Studies, List A, B, C or D (6 Credits) F/W | 6

Plus One Of:

- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 400 Technology, Engineering & Management (TEAM) FW | K7
OR
- CHEE 408 Bioengineering Research Project FW | K7

Minimum Total Credits: 36

Technical Electives

Students in the Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-plan (CHE2) must take a minimum of 9 credits in technical electives. One (1) technical elective must be taken from the CHE1 Group A List and two (2) technical electives from the Group C list.

Chemical Process and Bioengineering Sub-plan: Technical Electives

Complementary Studies

Students choose 9 credits from the approved Lists A, B, C, or D of which 6 credits must be taken from List A. Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Economics

To meet the engineering economics requirement, students take CHEE 310 (this is a CORE course).

Communications

To meet the communications course requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

Civil Engineering

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2nd Year Advisor M. Green

3rd Year Advisor A.M. da Silva

4th Year Advisor Y. Fillion

Civil Engineering focuses on the analysis, design, and improvement of the human environment—both natural and constructed. Our students will learn how the world works and will provide improvements in the overall quality of life, make better use of limited resources, develop sustainable technologies, and create attractive and functional places to live and work.

Civil Engineering at Queen's University prepares students to identify emerging issues and develop innovative solutions to the numerous civil engineering, societal, and global challenges of the future.

The core undergraduate curriculum covers the key components of today's Civil Engineering professions. The study of environmental and sustainability issues is integrated throughout the academic plan to better reflect that the assessment of these concerns is integral to all civil engineering projects. The first three years of our plan provide broad-based training in: mathematics; science (physics, chemistry & geology); fluid, structural and soil mechanics; materials (water, concrete, steel, soil & plastics); and engineering problem solving & design. Students in their fourth year are able to either specialize in an area of interest, or further diversify their training. Specialization can be under the themes of buildings & structures, water & the environment, or geoengineering. This student choice arises in the selection of: technical electives, topics for realistic design projects, areas to conduct advanced research, and practical industrial internships.

Civil Engineering, B.A.Sc. (Class of 2018)

Second Year Common CORE- 2015/16

- APSC 200 Engineering Design and Practice II F/W | K4

- APSC 293 Engineering Communications I F/W | K1
- CIVL 200 Professional Skills I F | K 2.5
- CIVL 210 Chemistry for Civil Engineers F | 4.5
- CIVL 230 Solid Mechanics I F | 4.25
- MTHE 224 Applied Mathematics for Civil Engineers F | 4.2
- Complementary Studies- Humanities & Social Sciences List A F | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CIVL 215 Materials for Civil Engineers W | 4.5
- CIVL 222 Numerical Methods for Civil Engineers W | 5
- CIVL 231 Solid Mechanics II W | 4.5
- CIVL 250 Hydraulics I W | 4

Minimum Credits: 44.45

Note: A minimum of 6 credits must be taken from Complementary Studies List A.

Third Year Common CORE -2016/17

- CIVL 300 Professional Skills II F | K 2.5
- CIVL 330 Structural Analysis F | 3.75
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 350 Hydraulics II F | 3.75
- CIVL 371 Groundwater Engineering F | 3.75
- Complementary Studies – Humanities & Social Sciences List A F | 3
- CIVL 331 Structural Steel Design W | 4
- CIVL 341 Geotechnical Engineering II W | 4
- CIVL 360 Civil Engineering Design and Practice III W | K4
- CIVL 372 Water and Wastewater Engineering W | 4
- Management Elective W | 3

Minimum Credits: 39.5

Note: A minimum of 6 credits must be taken from Complementary Studies List A.

Fourth Year Common CORE -2017/18

- CIVL 400 Professional Skills III F | 2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies- List A, B, C, or D F | 3
- Electives F&W | 25.75

Minimum Credits: 37.25

Electives

All students must choose EIGHT Electives, *at least SIX of which must be Technical Electives from List 1 shown below*. The SEVENTH Elective may be from List 1 or List 2 shown below. The **EIGHTH** Elective may be from List 1 or List 2 or a Free Elective - see course list below.

Civil Engineering: Technical Electives

A Free Elective can be any of the following courses with a minimum of 3 credits:

- Any 3 credit course appearing anywhere in the Applied Science calendar, in the course descriptions list, in the requirements for any academic plan, or in the lists of eligible complementary studies courses
- Any course at the 100 level or higher from the Arts and Science calendar with any of the following subject codes: ANAT, BCHM, BIOL, CDNS, CHEM, CISC, COGS, COMM, DEVS, GEOL, GIMS, GISC, GISQ, GPHY, HLTH, IDIS, INTS, ENSC, EPID, LING, MATH, MICR, PHAR, PHYS, PHGY, STSC, STAT, WRIT
- Any of the graduate courses offered in Urban and Regional Planning

*Free Electives must be approved by the Undergraduate Chair

*APSC 480: Units will not count towards the requirements of taking at least six Technical Electives from List 1 but because of the number of units, they will count towards a second List 2 or Free Elective.

Civil Engineering, B.A.Sc. (Class of 2019)

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CIVL 200 Professional Skills I F | K 2.5
- CIVL 210 Chemistry for Civil Engineers F | 4.5
- CIVL 230 Solid Mechanics I F | 4.25
- MTHE 224 Applied Mathematics for Civil Engineers F | 4.2
- Complementary Studies - Humanities & Social Sciences List A F | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CIVL 215 Materials for Civil Engineers W | 4.5
- CIVL 222 Numerical Methods for Civil Engineers W | 5
- CIVL 231 Solid Mechanics II W | 4.5
- CIVL 250 Hydraulics I W | 4

Minimum Total Credits: 44.45

Note: A minimum of 6 credits must be taken from Complementary Studies List A.

Third Year CORE 2017-2018

- CIVL 300 Professional Skills II F | K 2.5
- CIVL 330 Structural Analysis F | 3.75
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 350 Hydraulics II F | 3.75
- CIVL 371 Groundwater Engineering F | 3.75

- Complementary Studies - Humanities & Social Sciences List A F | 3
- CIVL 331 Structural Steel Design W | 4
- CIVL 341 Geotechnical Engineering II W | 4
- CIVL 360 Civil Engineering Design and Practice III W | K4
- CIVL 372 Water and Wastewater Engineering W | 4
- Management Elective W | 3

Minimum Total Credits: 39.5

Note: A minimum of 6 credits must be taken from Complementary Studies List A.

Fourth Year CORE 2018-2019

- CIVL 400 Professional Skills III F | 2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies - List A, B, C, or D F | 3
- Electives F&W 25.75

Minimum Total Credits: 37.25

Electives

All students must choose EIGHT Electives, *at least SIX of which must be Technical Electives from List 1 shown below*. The SEVENTH Elective may be from List 1 or List 2 shown below. The **EIGHTH** Elective may be from List 1 or List 2 or a Free Elective - see course list below.

Civil Engineering: Technical Electives

A Free Elective can be any of the following courses with a minimum of 3 credits:

- Any 3 credit course appearing anywhere in the Applied Science calendar, in the course descriptions list, in the requirements for any academic plan, or in the lists of eligible complementary studies courses
- Any course at the 100 level or higher from the Arts and Science calendar with any of the following subject codes: ANAT, BCHM, BIOL, CDNS, CHEM, CISC, COGS, COMM, DEVS, GEOL, GIMS, GISC, GISQ, GPHY, HLTH, IDIS, INTS, ENSC, EPID, LING, MATH, MICR, PHAR, PHYS, PHGY, STSC, STAT, WRIT
- Any of the graduate courses offered in Urban and Regional Planning

Free Electives must be approved by the Undergraduate Chair

*APSC 480: Units will not count towards the requirements of taking at least six Technical Electives from List 1 but because of the number of units, they will count towards a second List 2 or Free Elective.

Civil Engineering, B.A.Sc. (Class of 2020)

Second Year CORE 2017-2018

- APSC 200 Engineering Design and Practice II F/W | K4

- APSC 293 Engineering Communications I F/W | K1
- CIVL 200 Professional Skills I F | K 2.5
- CIVL 210 Chemistry for Civil Engineers F | 4.5
- CIVL 230 Solid Mechanics I F | 4.25
- MTHE 224 Applied Mathematics for Civil Engineers F | 4.2
- Complementary Studies- Humanities & Social Sciences List A F | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CIVL 215 Materials for Civil Engineers W | 4.5
- CIVL 222 Numerical Methods for Civil Engineers W | 5
- CIVL 231 Solid Mechanics II W | 4.5
- CIVL 250 Hydraulics I W | 4

Minimum Total Credits: 44.45

Note: A minimum of 6 credits must be taken from Complementary Studies List A.

Third Year CORE 2018-2019

- CIVL 300 Professional Skills II F | K 2.5
- CIVL 330 Structural Analysis F | 3.75
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 350 Hydraulics II F | 3.75
- CIVL 371 Groundwater Engineering F | 3.75
- Complementary Studies - Humanities & Social Sciences List A F | 3
- CIVL 331 Structural Steel Design W | 4
- CIVL 341 Geotechnical Engineering II W | 4
- CIVL 360 Civil Engineering Design and Practice III W | K4
- CIVL 372 Water and Wastewater Engineering W | 4
- Management Elective W | 3

Minimum Total Credits: 39.5

Note: A minimum of 6 credits must be taken from Complementary Studies List A.

Fourth Year CORE 2019-2020

- CIVL 400 Professional Skills III F | 2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies- List A, B, C, or D F | 3
- Electives F&W | 25.75

Minimum Credits: 37.25

Electives

All students must choose EIGHT Electives, **at least SIX of which must be Technical Electives from List 1 shown below**. The SEVENTH Elective may be from List 1 or List 2 shown below. The EIGHTH Elective may be from List 1 or List 2 or a Free Elective - see course list below.

Civil Engineering: Technical Electives

A Free Elective can be any of the following courses with a minimum of 3 credits

- Any 3 credit course appearing anywhere in the Applied Science calendar, in the course descriptions list, in the requirements for any academic plan, or in the lists of eligible complementary studies courses
- Any course at the 100 level or higher from the Arts and Science calendar with any of the following subject codes: ANAT, BCHM, BIOL, CDNS, CHEM, CISC, COGS, COMM, DEVS, GEOL, GIMS, GISC, GISQ, GPHY, HLTH, IDIS, INTS, ENSC, EPID, LING, MATH, MICR, PHAR, PHYS, PHGY, STSC, STAT, WRIT
- Any of the graduate courses offered in Urban and Regional Planning

Free Electives must be approved by the Undergraduate Chair

*APSC 480: Units will not count towards the requirements of taking at least six Technical Electives from List 1 but because of the number of units, they will count towards a second List 2 or Free Elective.

Computer Engineering

Department Head M. Greenspan

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Computer Engineers deal with the architecture, design, implementation, and verification of the hardware and software for computing systems that are increasingly being used in embedded or networked environments. The Computer Engineering plan offers a broad range of supporting course material to prepare graduates for entry into the profession. In the hardware area, courses cover digital logic and digital systems engineering, computer organization and system architecture, microprocessors, and integrated circuit engineering. Software courses include programming languages, data structures and algorithms, operating systems, real-time software design, databases, compilers, software requirements analysis, formal methods in software engineering, and techniques for human-computer interaction. Computer communication network courses include material on reliable and secure information transfer protocols, switching and routing through multipath networks, and wireless networking.

The Computer Engineering plan is "streamed". Through choice of elective courses in third and fourth year, students can either focus their studies in one or more areas of specialization ("streams"), or pursue a broader coverage of the subject field. Streams are detailed on the Departmental web pages.

First Year courses in Computer Science (APSC 142), Mathematics (APSC 171, APSC 172 and APSC 174), Engineering Practice (APSC 100) and Physics (APSC 112) form the basis for further study in Computer Engineering. Good performance is advisable for students planning to enter this academic plan.

Computer Engineering, B.A.Sc. (Class of 2018)

Elective courses in years three and four are to be chosen from Electives Lists A, B and C shown below (under Fourth Year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

1. Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 4 courses from combined Electives Lists B and C (but no more than 5 courses taken from List C can be counted towards fulfilling the degree program). Courses that qualify to be on Lists B and C will change yearly to reflect any instructor changes.
3. Have at least 5 four-hundred level elective courses.
4. Counting required core courses, plus elective courses chosen for second, third and fourth year, result in a total of not less than 116.5 credits for those years.

Available combinations of elective courses are subject to timetabling constraints.

Second Year Common CORE – 2015/16

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F | 3
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 252 Electronics I W | 4.25
- ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5

Total Credits: 44.5

Remaining Credits Balance: 72

Third Year Common CORE – 2016/17

- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 377 Operating Systems F | 4
- CMPE 365 Algorithms I F | 4
- CMPE 380 Deleted - Algorithms Laboratory F | K 1
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 373 Computer Networks W | 3
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 390 Electrical and Computer Engineering Design W | K2.25 *

- CMPE 223 Software Specifications W | 3
- OR
- CMPE 320 Fundamentals of Software Development F | 4

- Electives Choose 2 electives from Electives Lists A or B or C (see lists under 4th year below) F/W | 6
- 1 of Complementary Studies List A F/W | 3-0-0 | 3

Total Credits: 40.25 or 41.25

Remaining Credits Balance: 31.75 or 30.75

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Fourth Year Common CORE – 2017/18

- ELEC 498 Computer Engineering Project FW | K7 *
- Electives Choose a sufficient number of Electives from List A or B or C to fulfil the minimum program requirements in all CEAB categories F/W | 21.75 or 20.75
- Complementary Studies, List A, B, C or D F/W | 3

Minimum Total Credits: 31.75 or 30.75

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Electives

Computer Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Computer Engineering Program, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 (communications units are also included inside course ELEC 498).

Computer Engineering, B.A.Sc. (Class of 2019)

Elective courses in years three and four are to be chosen from Electives Lists A, B and C shown below (under Fourth Year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

1. Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 4 courses from combined Electives Lists B and C (but no more than 5 courses taken from List C can be counted towards fulfilling the degree program). Courses that qualify to be on Lists B and C will change yearly to reflect any instructor changes.
3. Have at least 5 four-hundred level elective courses.
4. Counting required core courses, plus elective courses chosen for second, third and fourth year, result in a total of not less than 116.5 credits for those years.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F | 3
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 252 Electronics I W | 4.25
- ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5

Minimum Total Credits: 44.5

Remaining Credits Balance: 72

Third Year CORE 2017-2018

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 377 Operating Systems F | 4
- CMPE 365 Algorithms I F | 4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 373 Computer Networks W | 3
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 390 Electrical and Computer Engineering Design W | K2.25 *
- CMPE 223 Software Specifications W | 3
- OR
- CMPE 320 Fundamentals of Software Development F | 4
- Electives: Choose 2 electives from Electives Lists A or B or C (see lists under 4th year below)
F/W 6

- 1 of Complementary Studies List A F/W 3

Minimum Total Credits: 40.25 or 41.25

Remaining Credits Balance: 31.75 or 30.75

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Fourth Year CORE 2018-2019

- ELEC 498 Computer Engineering Project FW | K7 *
- Electives: Choose a sufficient number of Electives from List A or B or C to fulfill the minimum program requirements in all CEAB categories F/W 21.75 or 20.75
- Complementary Studies - List A, B, C, or D F/W 3

Minimum Total Credits: 31.75 or 30.75

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Electives

Computer Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Computer Engineering Program, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 (communications units are also included inside course ELEC 498).

Computer Engineering, B.A.Sc. (Class of 2020)

Elective courses in years three and four are to be chosen from Electives Lists A, B and C shown below (under Fourth Year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

1. Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 4 courses from combined Electives Lists B and C (but no more than 5 courses taken from List C can be counted towards fulfilling the degree program). Courses that qualify to be on Lists B and C will change yearly to reflect any instructor changes.
3. Have at least 5 four-hundred level elective courses.
4. Counting required core courses, plus elective courses chosen for second, third and fourth year, result in a total of not less than 116.5 credits for those years.

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2017-2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F | 3
- ELEC 252 Electronics I W | 4.25
- ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5

Minimum Total Credits: 44.5

Remaining Credits Balance: 72

Third Year CORE 2018-2019

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 377 Operating Systems F | 4
- CMPE 365 Algorithms I F | 4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 373 Computer Networks W | 3
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 390 Electrical and Computer Engineering Design W | K2.25 *

- CMPE 223 Software Specifications W | 3
- OR
- CMPE 320 Fundamentals of Software Development F | 4

- Electives Choose 2 electives from Electives Lists A or B or C (see lists under 4th year below) F/W | 6
- Complementary Studies List A F/W | 3

Total Credits: 40.25 or 41.25

Remaining Credits Balance: 31.75 or 30.75

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Fourth Year CORE 2019-2020

- ELEC 498 Computer Engineering Project FW | K7 *
- Electives: Choose a sufficient number of Electives from List A or B or C to fulfil the minimum program requirements in all CEAB categories F/W | 21.75 or 20.75
- Complementary Studies, List A, B, C or D F/W | 3

Minimum Total Credits: 31.75 or 30.75

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Electives

Computer Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Computer Engineering Plan, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 (communications units are also included inside course ELEC 498).

Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2019)

Elective courses in years three and four are to be chosen from Electives Lists A, B and C shown below (under Fourth Year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

- 1) Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.

2) Have at least 4 courses from combined Electives Lists B and C (but no more than 5 courses taken from List C can be counted towards fulfilling the degree program). Courses that qualify to be on Lists B and C will change yearly to reflect any instructor changes.

3) Have at least 5 four-hundred level elective courses.

4) Counting required core courses, plus elective courses chosen for second, third and fourth year, result in a total of not less than 122.5 credits for those years.

Available combinations of elective courses are subject to timetabling constraints

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- COMM 201 Introduction to Business for Entrepreneurs F | 3
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F/W | 3
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 252 Electronics I W | 4.25
- ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5

Minimum Total Credits: 47.5

Remaining Credits Balance: 75

Third Year CORE 2017-2018

- COMM 301 Funding New Ventures F | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 377 Operating Systems F | 4
- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- COMM 302 Launching New Ventures W | 3
- ELEC 373 Computer Networks W | 3
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 390 Electrical and Computer Engineering Design W | K2.25 *
Take ONE of CMPE 223 or CMPE 320 as Core:
- CMPE 223 Software Specifications W | 3
OR
- CMPE 320 Fundamentals of Software Development F | 4
- Electives: Choose 2 electives from Electives Lists A or B or C (see lists under 4th year below) F/W
6
- 1 of Complementary Studies List A F/W | 3

Minimum Total Credits: 43.25 or 44.25

Remaining Credits Balance: 31.75 or 30.75

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Fourth Year CORE 2018-2019

- ELEC 498 Computer Engineering Project FW | K7 *
- ECEI 400 Pitching and Launching Your New Venture W | 3 **
- Electives: Choose a sufficient number of Electives from List A or B or C to fulfill the minimum program requirements in all CEAB categories F/W | 21.75 or 20.75

Minimum Total Credits: 31.75 or 30.75

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Electives

Computer Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

ECEi students are required to take a total of five Complementary Studies courses over 2nd, 3rd and 4th year: two elective Complementary Studies courses from List A (Humanities and Social Sciences) and the required three List B/D courses COMM 301, COMM 302, ECEi 400.

**Subject to approval.

ECEi 400 course is included for information and future planning purpose.

Computer Engineering, ECEi Stream, B.A.Sc. (Class of 2020)

Elective courses in years three and four are to be chosen from Electives Lists A, B and C shown below (under Fourth Year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

- 1) Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
- 2) Have at least 4 courses from combined Electives Lists B and C (but no more than 5 courses taken from List C can be counted towards fulfilling the degree program). Courses that qualify to be on Lists B and C will change yearly to reflect any instructor changes.
- 3) Have at least 5 four-hundred level elective courses.
- 4) Counting required core courses, plus elective courses chosen for second, third and fourth year, result in a total of not less than 122.5 credits for those years.

Available combinations of elective courses are subject to timetabling constraints

Second Year CORE 2017-2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- COMM 201 Introduction to Business for Entrepreneurs F | 3
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F | 3
- ELEC 252 Electronics I W | 4.25
- ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 279 Introduction to Object Oriented Programming W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5

Minimum Total Credits: 47.5

Remaining Credits Balance: 75

Third Year CORE 2018-2019

- COMM 301 Funding New Ventures F | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 377 Operating Systems F | 4
- CMPE 365 Algorithms I F | 4
- ELEC 326 Probability and Random Processes F | 3.5
- COMM 302 Launching New Ventures W | 3
- ELEC 373 Computer Networks W | 3
- ELEC 374 Digital Systems Engineering W | 4.25
- ELEC 390 Electrical and Computer Engineering Design W | K2.25 *
- **Take ONE of CMPE 223 or CMPE 320 as Core:**
- CMPE 223 Software Specifications W | 3

OR

- CMPE 320 Fundamentals of Software Development F | 4
- Electives Choose 2 electives from Electives Lists A or B or C (see lists under 4th year below) F/W | 6
- 1 of Complementary Studies List A F/W | 3

Minimum Total Credits: 43.25 or 44.25

Remaining Credits Balance: 31.75 or 30.75

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Fourth Year CORE 2019-2020

- ELEC 498 Computer Engineering Project FW | K7 *
- ECEI 400 Pitching and Launching Your New Venture W | 3 **
- Electives: Choose a sufficient number of Electives from List A or B or C to fulfill the minimum program requirements in all CEAB categories F/W | 21.75 or 20.75

Minimum Total Credits: 31.75 or 30.75

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 498

Electives

Computer Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

ECEi students are required to take a total of five Complementary Studies courses over 2nd, 3rd and 4th year: two elective Complementary Studies courses from List A (Humanities and Social Sciences) and the required three List B/D courses COMM 301, COMM 302 and ECEi 400.

**Subject to approval.

ECEi 400 course is included for information and future planning purpose.

Electrical Engineering

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Electrical Engineers deal with telecommunications, computers, electronics, signal processing, robotics, biomedicine, transportation, industrial process control, electrical power generation and distribution, and design and operation of industrial machinery. The Electrical Engineering plan is intended to prepare graduates for entry into this broad discipline. Fundamental courses in electric and electronic circuits, electromagnetics, signals and systems, applied mathematics, and other topics in second and third year provide the basis for specialization in a number of areas through more advanced elective courses in signal processing, digital and wireless communication, control systems, electric machines, robotics, power electronics, microwave and optical communication systems, and integrated circuit engineering. The Electrical Engineering plan also incorporates core and elective courses in digital logic, computer systems, and software for additional breadth.

The Electrical Engineering plan is "streamed". Through choice of elective courses in third and fourth year, students can either focus their studies in one or more areas of specialization ("streams"), or pursue a broader coverage of the subject field. Streams are detailed on the Departmental web pages.

First year courses in Mathematics (APSC 171, APSC 172, APSC 174), Physics (APSC 112), Engineering Practice (APSC 100) and Computing (APSC 142) form the basis for further study in Electrical Engineering. Good performance in these courses is advisable for students planning to enter this program.

Electrical Engineering, B.A.Sc. (Class of 2018)

Elective courses in years three and four are to be chosen from Electives Lists A and B (shown under fourth year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

1. Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 courses from Electives List A.
3. Have at least 5 four-hundred level elective courses.
4. Result in a total of not less than 116.5 credits counting all courses for second, third and fourth years (remaining AU balance is shown below after each year).

Available combinations of elective courses are subject to timetabling constraints.

Second Year Common CORE – 2015/16

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F | 3-0-0 | 3

- ELEC 252 Electronics I W | 4.25
- ELEC 273 Numerical Methods and Optimization W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5

Total Credits: 44.0

Remaining Credits Balance: 72.5

Third Year Common CORE – 2016/17

- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 353 Electronics II F | 4.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 381 Applications of Electromagnetics F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 390 Electrical and Computer Engineering Design W | K2.25
*
- ENPH 336 Solid State Devices W | 3.25
- Electives 1 of Electives List A or B F/W | 3
- 1 of Electives List A of B F/W | 3
- 1 of Complementary Studies List A F/W | 3-0-0 | 3
* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Total Credits: 41

Remaining Credits Balance: 31.50

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Fourth Year Common CORE – 2017/18

- ELEC 490 Electrical Engineering Project FW | K7 *
- Complementary Studies, List A, B, C or D F/W | 3
- Electives F/W | 21.25

Total Credits: 31.50

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Electives

Electrical Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the ECE Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Electrical Engineering Plan, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 (1 credit of communications units are also included in course ELEC 490).

Electrical Engineering, B.A.Sc. (Class of 2019)

Elective courses in years three and four are to be chosen from Electives Lists A and B (shown under fourth year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

1. Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 courses from Electives List A.
3. Have at least 5 four-hundred level elective courses.
4. Result in a total of not less than 116.5 credits counting all courses for second, third and fourth years (remaining AU balance is shown below after each year).

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies - List A F | 3
- ELEC 252 Electronics I W | 4.25
- ELEC 273 Numerical Methods and Optimization W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5

Minimum Total Credits: 44

Remaining Credits Balance: 72.50

Third Year CORE 2017-2018

- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 353 Electronics II F | 4.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 381 Applications of Electromagnetics F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ELEC 390 Electrical and Computer Engineering Design W | K2.25
*
- ENPH 336 Solid State Devices W | 3.25
- Choose 2 electives from Electives Lists A or B (see lists under 4th year below) | 6
- 1 of Complementary Studies List A F/W | 3
* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Minimum Total Credits: 41

Remaining Credits Balance: 31.5

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Fourth Year CORE 2018-2019

- ELEC 490 Electrical Engineering Project FW | K7 *
- Complementary Studies, List A, B, C or D F/W | 3
- Electives F/W | 21.5

Minimum Total Credits: 31.5

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Electives

Electrical Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the ECE Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Electrical Engineering Plan, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 (1 credit of communications units are also included in course ELEC 490).

Electrical Engineering, B.A.Sc. (Class of 2020)

Elective courses in years three and four are to be chosen from Electives Lists A and B (shown under fourth year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

1. Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
2. Have at least 5 courses from Electives List A.
3. Have at least 5 four-hundred level elective courses.
4. Result in a total of not less than 116.5 credits counting all courses for second, third and fourth years (remaining AU balance is shown below after each year).

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2017-2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F | 3
- ELEC 252 Electronics I W | 4.25
- ELEC 273 Numerical Methods and Optimization W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5

Minimum Total Credits: 44

Remaining Credits Balance: 72.50

Third Year CORE 2018-2019

- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 326 Probability and Random Processes F | 3.5

- ELEC 353 Electronics II F | 4.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 381 Applications of Electromagnetics F | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ELEC 390 Electrical and Computer Engineering Design W | K2.25
*
- ENPH 336 Solid State Devices W | 3.25
- Choose 2 electives from Electives Lists A or B (see lists under 4th year below) | 6
- 1 of Complementary Studies List A F/W | 3

Remaining Credits Balance: 31.5

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Fourth Year CORE 2019-2020

- ELEC 490 Electrical Engineering Project FW | K7 *
- Complementary Studies, List A, B, C or D F/W | 3
- Electives F/W | 21.5

Total Credits: 31.5

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Electives

Electrical Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the ECE Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Electrical Engineering Plan, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 (1 credit of communications units are also included in course ELEC 490).

Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2019)

Elective courses in years three and four are to be chosen from Electives Lists A and B (shown under fourth year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

- 1) Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
- 2) Have at least 5 courses from Electives List A.
- 3) Have at least 5 four-hundred level elective courses.
- 4) Result in a total of not less than 122.5 credits counting all courses for second, third and fourth years (remaining AU balance is shown below after each year).

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- COMM 201 Introduction to Business for Entrepreneurs F | 3
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F/W | 3
- ELEC 252 Electronics I W | 4.25
- ELEC 273 Numerical Methods and Optimization W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5

Minimum Total Credits: 47

Remaining Credits Balance: 75.50

Third Year CORE 2017-2018

- COMM 301 Funding New Ventures F | 3
- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 353 Electronics II F | 4.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 381 Applications of Electromagnetics F | 3.5
- ELEC 326 Probability and Random Processes F | 3.5
- COMM 302 Launching New Ventures W | 3
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ELEC 390 Electrical and Computer Engineering Design W | K2.25
- *
 - ENPH 336 Solid State Devices W | 3.25
 - 1 of Electives List A or B F/W | 3

- 1 of Electives List A or B F/W | 3
- 1 of Complementary Studies List A F/W | 3
* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Minimum Total Credits: 44

Remaining Credits Balance: 31.50

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Fourth Year CORE 2018-2019

- ELEC 490 Electrical Engineering Project FW | K7 *
- ECEI 400 Pitching and Launching Your New Venture W | 3 **
- Electives F/W | 21.50

Minimum Total Credits: 31.50

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Electives

Electrical Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

ECEi students are required to take a total of five Complementary Studies courses over 2nd, 3rd and 4th year: two elective Complementary Studies courses from List A (Humanities and Social Sciences) and the required three List B/D courses COMM 301, COMM 302, and ECEi 400.

**Subject to approval.

ECEi 400 course is included for information and future planning purpose.

Electrical Engineering, ECEi Stream, B.A.Sc. (Class of 2020)

Elective courses in years three and four are to be chosen from Electives Lists A and B (shown under fourth year), and by consulting suggested Streams and prerequisite paths. Your complete degree program must:

- 1) Exceed the minimum Accreditation Units (AU) set by ECE in each CEAB category.
- 2) Have at least 5 courses from Electives List A.
- 3) Have at least 5 four-hundred level elective courses.
- 4) Result in a total of not less than 122.5 credits counting all courses for second, third and fourth years (remaining AU balance is shown below after each year).

Available combinations of elective courses are subject to timetabling constraints.

Second Year CORE 2017-2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- COMM 201 Introduction to Business for Entrepreneurs F | 3
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3
- Complementary Studies, List A F/W | 3
- ELEC 252 Electronics I W | 4.25
- ELEC 273 Numerical Methods and Optimization W | 3.5
- ELEC 274 Computer Architecture W | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5

Minimum Total Credits: 47

Remaining Credits Balance: 75.5

Third Year CORE 2018-2019

- COMM 301 Funding New Ventures F | 3
- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 353 Electronics II F | 4.5
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 381 Applications of Electromagnetics F | 3.5
- ELEC 326 Probability and Random Processes F | 3.5
- COMM 302 Launching New Ventures W | 3
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ELEC 390 Electrical and Computer Engineering Design W | K2.25 *
- ENPH 336 Solid State Devices W | 3.25

- 1 of Electives List A or B F/W | 3
- 1 of Electives List A of B F/W | 3
- 1 of Complementary Studies List A F/W | 3-0-0 | 3

Minimum Total Credits: 44

Remaining Credits Balance: 31.50

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Fourth Year CORE 2019-2020

- ELEC 490 Electrical Engineering Project FW | K7 *
- ECEI 400 Pitching and Launching Your New Venture W | 3 **
- Electives F/W | 21.50

Minimum Total Credits: 31.50

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 490

Electives

Electrical Engineering: Electives

Course Prerequisites

Normally, registration in a course offered by the ECE Department is allowed provided a mark of at least D- has been achieved in each of the prerequisites for the course. Students having one course prerequisite (numbered 200 or higher) with a mark of FR may still be able to register in a course offered by the Department provided their Engineering Cumulative GPA is at least 2.0 at the end of the previous session. Prerequisites are listed under the calendar description for each course.

Complementary Studies

ECEi students are required to take a total of five Complementary Studies courses over 2nd, 3rd and 4th year: two elective Complementary Studies courses from List A (Humanities and Social Sciences) and the required three List B/D courses COMM 301, COMM 302, and ECEi 400.

**Subject to approval.

ECEi 400 course is included for information and future planning purpose.

Engineering Chemistry

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The Engineering Chemistry program is offered by the Department of Chemical Engineering with the close cooperation of the Department of Chemistry. The academic program is accredited by the Canadian Engineering Accreditation Board as an engineering discipline and the Canadian Society for Chemistry as a chemistry program. The curriculum integrates a core of chemistry with a body of engineering in a manner that allows chemical knowledge to be put into practice. Beginning with a concentration on basic engineering principles, science, and mathematics, students can gain specialization in areas such as process chemistry, materials science, biosciences and pharmaceuticals, through selection of electives and thesis project. They also work on group design projects throughout the design spine. In their fourth year students work on a year-long research thesis project, under the supervision of academic staff. All students have access to a computing facility, equipped with software programs and simulators.

Ancillary Fees

Chemical Engineering and Engineering Chemistry students may be required to pay ancillary fees for course related learning materials, safety equipment and field trips.

Engineering Chemistry, B.A.Sc. (Class of 2018)

Second Year Common Core -2015-2016

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- ENCH 213 Introduction to Chemical Analysis F | 4.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 47

Third Year Common Core 2016-2017

- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5

- ENCH 312 Transition Metal Chemistry F | 3.5
- ENCH 398 Experimental Chemistry I F | 3.5
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 324 Organic Process Development W | 3.5
- CHEE 333 Design of Unit Operations W | K 4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- ENCH 399 Experimental Chemistry II W | 3.5
- Electives (minimum 6 credits) F/W | 6

Plus One Of:

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 ¹
- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5 ¹

Minimum Credits: 42.5

¹ ENCH students choose either APSC 221 or CHEE 310 (but not both). NOTE: This course will NOT be preloaded like CORE courses; students will need to register for their choice in SOLUS during registration.

Fourth Year Common Core 2017-2018

- CHEE 460 Applied Surface and Colloid Science F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- ENCH 313 Quantum Mechanics F | 3.5
- ENCH 417 Research Project FW | 9
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 461 Electrochemical Engineering W | 3.5
- Electives (minimum 12 credits) F/W | 12

Plus One Of:

- CHEE 340 Biomedical Engineering W | 3.5 ¹
- CHEE 380 Biochemical Engineering F | 3.5 ¹

Minimum Total Credits: 46

¹ ENCH students choose either CHEE 340 or CHEE 380. NOTE: This course will NOT be preloaded like CORE courses; students will need to register for their choice in SOLUS during registration.

Electives:

In addition to the CORE courses listed in 2nd, 3rd and 4th year, ENCH students are required to take the following:

1. Nine (9) credits of Complementary Studies electives, of which six (6) credits must be from approved List A, the remaining three (3) credits from either List A, B, C or D.

2. Two (2) Technical Elective courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists), and one (1) Technical Elective course from the approved Group B list.

Engineering Chemistry: Technical Electives

Engineering Economics:

To meet the engineering economics requirement, students take either APSC 221 or CHEE 310 (this is a CORE course).

Communications:

To meet the communications requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Chemistry, B.A.Sc. (Class of 2019)

Second Year CORE 2016-2017

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- ENCH 213 Introduction to Chemical Analysis F | 4.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 47

Third Year CORE 2017-2018

- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- ENCH 312 Transition Metal Chemistry F | 3.5
- ENCH 397 Experimental Chemistry FW | 7
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 324 Organic Process Development W | 3.5

- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- ELECTIVES (minimum 3 credits) F/W| 3

Plus One Of:

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 ¹
- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5 ¹

Plus One Of:

- CHEE 340 Biomedical Engineering W | 3.5 ²
- CHEE 380 Biochemical Engineering F | 3.5 ²

Minimum Total Credits: 43

¹ ENCH students choose either APSC 221 or CHEE 310 (but not both). NOTE: This course will NOT be preloaded like CORE courses; students will need to register for their choice in SOLUS during registration.

² ENCH students choose either CHEE 340 or CHEE 380. NOTE: This course will NOT be preloaded like CORE courses; students will need to register for their choice in SOLUS during registration.

Fourth Year CORE 2018-2019

- CHEE 460 Applied Surface and Colloid Science F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- ENCH 313 Quantum Mechanics F | 3.5
- ENCH 417 Research Project FW | 9
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 461 Electrochemical Engineering W | 3.5
- Electives (minimum 15 credits) F/W | 15

Minimum Total Credits: 45.5

Electives

In addition to the CORE courses listed in 2nd, 3rd and 4th year, ENCH students are required to take the following:

1. Nine (9) credits of Complementary Studies electives, of which six (6) credits must be from approved List A, the remaining three (3) credits from either List A, B, C or D.
2. Two (2) Technical Elective courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists), and one (1) Technical Elective course from the approved Group B list.

Engineering Chemistry: Technical Electives

Engineering Economics

To meet the engineering economics requirement, students take either APSC 221 or CHEE 310 (this is a CORE course).

Communications

To meet the communications requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Chemistry, B.A.Sc. (Class of 2020)

Second Year CORE 2017-2018

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 221 Chemical Processes and Systems F | 3.5
- ENCH 211 Main Group Chemistry F | 4.5
- ENCH 212 Principles of Chemical Reactivity F | 3.75
- ENCH 213 Introduction to Chemical Analysis F | 4.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- CHEE 222 Process Dynamics and Numerical Methods W | 3.5
- CHEE 223 Fluid Mechanics W | 3.5
- ENCH 222 Methods of Structure Determination W | 3.75
- ENCH 245 Applied Organic Chemistry I W | 4.5

Minimum Total Credits: 47

Third Year CORE 2018-2019

- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 321 Chemical Reaction Engineering F | 3.5
- CHEE 330 Heat and Mass Transfer F | 3.5
- ENCH 312 Transition Metal Chemistry F | 3.5
- ENCH 397 Experimental Chemistry FW | 7
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 324 Organic Process Development W | 3.5
- CHEE 331 Design of Unit Operations W | K 4.5
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- Electives (minimum 3 credits) F/W | 3

Plus One Of:

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 ¹
- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5 ¹

Plus One Of:

- CHEE 340 Biomedical Engineering W | 3.5 ²
- CHEE 380 Biochemical Engineering F | 3.5 ²

Minimum Credits: 43

¹ ENCH students choose either APSC 221 or CHEE 310 (but not both). NOTE: This course will NOT be preloaded like CORE courses; students will need to register for their choice in SOLUS during registration.

² ENCH students choose either CHEE 340 or CHEE 380. NOTE: This course will NOT be preloaded like CORE courses; students will need to register for their choice in SOLUS during registration

Fourth Year CORE 2019-2020

- CHEE 460 Applied Surface and Colloid Science F | 3.5
- CHEE 470 Design of Manufacturing Processes F | K 7
- ENCH 313 Quantum Mechanics F | 3.5
- ENCH 417 Research Project FW | 9
- CHEE 315 Laboratory Projects II F/W | 4
- CHEE 461 Electrochemical Engineering W | 3.5
- Electives (minimum 15 credits) F/W | 15

Minimum Total Credits: 45.5

Electives

In addition to the CORE courses listed in 2nd, 3rd and 4th year, ENCH students are required to take the following:

1. Nine (9) credits of Complementary Studies electives, of which six (6) credits must be from approved List A, the remaining three (3) credits from either List A, B, C or D.
2. Two (2) Technical Elective courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists), and one (1) Technical Elective course from the approved Group B list.

Engineering Chemistry: Technical Electives

Engineering Economics

To meet the engineering economics requirement, students take either APSC 221 or CHEE 310 (this is a CORE course).

Communications

To meet the communications requirement, students take APSC 293 and CHEE 361 (these are CORE courses).

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans.

Engineering Physics

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Core courses in the Engineering Physics plan provide the student with fundamental physical principles and theoretical tools for professional practice as well as a firm foundation in modern experimental techniques. To relate these abilities to the attitudes and knowledge of other engineering disciplines, the plan has four sub-plans: electrical, materials, mechanical, and computing. These sub-plans provide a sequence of courses in other engineering departments and thus provide career or graduate studies opportunities in both engineering and applied physics.

NOTE: Students will not be registered in any core second year engineering physics courses until they have passed all the required first year mathematics and physics courses. It is strongly recommended that students have a grade of C- or better in the first year mathematics and physics courses.

Fourth year elective courses must be chosen such that at the end of the academic plan each student meets or exceeds the Canadian Engineering Accreditation Board (CEAB) program requirements. A spreadsheet will be provided by the Undergraduate Chair to aid fourth year students with their course selection.

Options available:

- Electrical Option
- Materials Option
- Mechanical Option
- Computing Option

Engineering Physics, B.A.Sc. (Class of 2018)

Second Year Common Core - 2015/2016

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- MTHE 227 Vector Analysis F | 3
- MTHE 237 Differential Equations for Engineering Science F | 3.25
- ENPH 242 Relativity and Quanta F | 3.5
- ELEC 221 Electric Circuits F | 4.25
- ENPH 211 Applied Physics W | 3.5
- ENPH 225 Mechanics W | 3.5
- ENPH 239 Electricity and Magnetism W | 3.5

- ENPH 252 Management of Experimental Data W | 1.25
- ENPH 253 Engineering Physics Laboratory W | K3.5
- ENPH 213 Computational Engineering Physics W | 4

Electrical Sub-Plan (P1)

- ELEC 271 Digital Systems F | 4.25
- ELEC 252 Electronics I W | 4.25

Materials Sub-Plan (P3)

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Mechanical Sub-Plan (P4)

- MECH 230 Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Computing Sub-Plan (P6)

- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4

Third Year Common Core - 2016/2017

- MTHE 338 Fourier Methods for Boundary Value Problems F | 3.5 *
- ENPH 344 Introduction to Quantum Mechanics F | 3.5
- ENPH 354 Engineering Physics Design Project W | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- Complementary Studies, List A W | 3 **
- ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5
- ENPH 353 Engineering Physics Laboratory II F | 2.5

Note:

* MTHE 338 may be replaced by taking ENPH 316 and ENPH 317 . ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.

** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

APSC 381 may be taken as a technical elective for students particularly interested in engineering design.

ENPH 491 and ENPH 495 are fourth year Physics List A electives offered every second year which students in their third year can consider taking.

Note: In February of Third Year students may apply for permission to take ENPH 456 and ENPH 457 as a combined alternate to (ENPH 455, a 4th year List "B" course, and the Engineering Elective), to facilitate an **Accelerated Master's** graduate degree ending 16 months after completion of the undergraduate Engineering Physics program. Details will be given in January of your 3rd year.

Electrical Sub-Plan (P1)

- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 353 Electronics II F | 4.5
- ENPH 372 Thermodynamics W | 3.5
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ENPH 336 Solid State Devices W | 3.25

Materials Sub-Plan (P3)

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
- MECH 370 Principles of Materials Processing F | 3.5
- ENPH 334 Electronics for Applied Scientists F | 5
- ENPH 372 Thermodynamics W | 3.5
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Mechanical Sub-Plan (P4)

- ENPH 334 Electronics for Applied Scientists F | 5
- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5

Computing Sub-Plan (P6)

- ELEC 271 Digital Systems F | 4.25
- ENPH 334 Electronics for Applied Scientists F | 5
- CMPE 320 Fundamentals of Software Development F | 4
- ELEC 274 Computer Architecture W | 4
- ENPH 372 Thermodynamics W | 3.5

Fourth Year Common Core - 2017/2018

- ENPH 431 Electromagnetic Theory F | 3.5
- ENPH 454 Advanced Engineering Physics Design Project F | 4.5 **
- Complementary Studies, List A F/W | 3 **
- Complementary Studies, List A, B, C or D F/W | 3 **
- Engineering Elective (any 200- 300- or 400-level Engineering and Applied Science course) F/W | 3
- ENPH 455 Engineering Physics Thesis FW | 4 *
- ENPH 453 Advanced Physics Laboratory W | 3.5

Note:

* Students may take (ENPH 456 and ENPH 457) as a combined alternate to ENPH 455, List "B" and Engineering Elective. See the description after 3rd year.

** Students may instead take APSC 480 APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9 as a substitute for ENPH 454 and one list "B" course. Note that APSC 480 has a prerequisite of APSC 381 or permission of the instructor.

Physics List A:

One from Physics List A:

- ENPH 317 Mathematical Methods in Physics II W | 3.5
- ENPH 321 Advanced Mechanics W | 3.5
- ENPH 414 Introduction to General Relativity F | 3
- ENPH 460 Laser Optics W | 3.5
- ENPH 472 Statistical Mechanics W | 3.5
- ENPH 480 Solid State Physics F | 3.5
- ENPH 483 Nanoscience and Nanotechnology W | 3.5
- ENPH 490 Nuclear Physics F | 3.5
- ENPH 491 Physics of Nuclear Reactors F | 3.5 ¹
- ENPH 495 Introduction to Medical Physics W | 3 ²

Note:

¹ ENPH 491 will be offered in 2017/2018 and alternate years thereafter.

² ENPH 495 will be offered in 2016/2017 and alternate years thereafter.

Electrical Sub-Plan (P1)

Two courses from Electrical List B, and one course from Electrical List B or Physics List A, at least one of which must be numbered above 400*:

Electrical List B:

- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 333 Electric Machines F | 4.5
- ELEC 344 Sensors and Actuators F | 3.25
- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3
- ELEC 421 Digital Signal Processing: Filters and System Design F | 4
- ELEC 422 NOT OFFERED 2017-2018 - Digital Signal Processing: Random Models and Applications F | 3
- ELEC 431 Power Electronics F | 3.25
- ELEC 443 Linear Control Systems W | 4
- ELEC 448 Introduction to Robotics: Mechanics and Control W | 3.5
- ELEC 451 Digital Integrated Circuit Engineering F | 3

- ELEC 454 Analog Electronics W | 3.25
- ELEC 457 NOT OFFERED 2017-2018 - Integrated Circuits and System Applications W | 3
- ELEC 461 NOT OFFERED 2017-2018 - Digital Communications F | 3.5
- ELEC 464 Wireless Communications F | 3
- ELEC 373 Computer Networks W | 3
- ELEC 476 DELETED - Modelling and Systems Simulation W | 3.5
- ELEC 478 DELETED - Computer Networks II W | 3
- ELEC 483 NOT OFFERED 2017-2018 - Microwave and RF Circuits and Systems W | 4.5
- ELEC 486 NOT OFFERED THIS YEAR-Fiber Optic Communications F | 3.75
- CHEE 340 Biomedical Engineering W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Materials Sub-Plan (P3)

- ENPH 480 Solid State Physics F | 3.5

Materials List B:

Two courses from Materials List B*:

- MDEP 437 Fuel Cell Technology F |
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 470 Deformation Processing W | 3.5
- MECH 476 NOT OFFERED THIS YEAR-Engineering of Polymers and Composite Materials W | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 479 Nano-Structured Materials W | 3.5
- MECH 483 Nuclear Materials F | 3.5
- MECH 484 Introduction to Ceramics F | 3.5
- CHEE 340 Biomedical Engineering W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a list B course above with a list B course from one of the other options within Engineering Physics.

Mechanical Sub-Plan (P4)

Mechanical List B:

Three courses: two from Mechanical List B, and one from Physics List A or Mechanical List B*:

- CHEE 340 Biomedical Engineering W | 3.5
- MDEP 437 Fuel Cell Technology F |
- MECH 420 Vibrations W | 3.5

- MECH 423 Introduction to Microsystems W | 3.5
- MECH 424 NOT OFFERED THIS YEAR - Sustainable Product Design W | 3.5
- MECH 430 NOT OFFERED THIS YEAR-Thermal Systems Design F | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 Turbomachinery F | 3.5
- MECH 441 NOT OFFERED THIS YEAR - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow F | 3.5
- MECH 452 Mechatronics Engineering F | 5
- MECH 456 Introduction to Robotics F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 481 NOT OFFERED THIS YEAR-Wind Energy F | 3.5
- MECH 482 NOT OFFERED THIS YEAR-Noise Control W | 3.5
- MECH 492 Biofluids W | 3.5
- MECH 495 Ergonomics and Design W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Computing Sub-Plan (P6)

Computing List B:

Three courses: two from Computing List B and one from Physics List A or Computing List B. At least one of the Computing List B courses must be numbered above 400*:

- CHEE 340 Biomedical Engineering W | 3.5
- CMPE 330 Computer-Integrated Surgery F | 3
- CMPE 365 Algorithms I F | 4
- CMPE 452 Neural Networks and Genetic Algorithms W | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision F | 3
- CMPE 458 Programming Language Processors W | 4
- CMPE 472 Medical Informatics W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 374 Digital Systems Engineering W | 4.25 ¹
- ELEC 377 Operating Systems F | 4
- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3

Note:

¹With permission of the instructor.

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other sub-plans within Engineering Physics.

Complementary Studies:

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Engineering Physics Plan, the Engineering Economics course is APSC 221, and the Communications requirements are met through courses in the core plan.

Engineering Physics, B.A.Sc. (Class of 2019)

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- MTHE 227 Vector Analysis F | 3
- MTHE 237 Differential Equations for Engineering Science F | 3.25
- ENPH 242 Relativity and Quanta F | 3.5
- ELEC 221 Electric Circuits F | 4.25
- ENPH 211 Applied Physics W | 3.5
- ENPH 225 Mechanics W | 3.5
- ENPH 239 Electricity and Magnetism W | 3.5
- ENPH 252 Management of Experimental Data W | 1.25
- ENPH 253 Engineering Physics Laboratory W | K3.5
- ENPH 213 Computational Engineering Physics W | 4

Electrical Sub-Plan (P1)

- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 252 Electronics I W | 4.25

Materials Sub-Plan (P3)

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Mechanical Sub-Plan (P4)

- MECH 230 Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Computing Sub-Plan (P6)

- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4

Notes:

** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

Third Year CORE 2017-2018

- MTHE 338 Fourier Methods for Boundary Value Problems F | 3.5 *
- ENPH 344 Introduction to Quantum Mechanics F | 3.5
- ENPH 354 Engineering Physics Design Project W | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- Complementary Studies, List A W | 3 **
- ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5
- ENPH 353 Engineering Physics Laboratory II F | 2.5

Note:

* MTHE 338 may be replaced by taking both ENPH 316 and ENPH 317 . ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.

** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

APSC 381 may be taken as a technical elective for students particularly interested in engineering design.

ENPH 491 and ENPH 495 are fourth year Physics List A electives offered every second year which students in their third year can consider taking.

Note: In February of Third Year students may apply for permission to take ENPH 456 and ENPH 457 as a combined alternate to (ENPH 455 , a 4th year List "B" course, and the Engineering Elective), to facilitate an **Accelerated Master's** graduate degree ending 16 months after completion of the undergraduate Engineering Physics program. Details will be given in January of your 3rd year.

Electrical Sub-Plan (P1)

- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 353 Electronics II F | 4.5
- ENPH 372 Thermodynamics W | 3.5
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ENPH 336 Solid State Devices W | 3.25

Materials Sub-Plan (P3)

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
- MECH 370 Principles of Materials Processing F | 3.5
- ENPH 334 Electronics for Applied Scientists F | 5
- ENPH 372 Thermodynamics W | 3.5
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Mechanical Sub-Plan (P4)

- ENPH 334 Electronics for Applied Scientists F | 5
- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5

Computing Sub-Plan (P6)

- ELEC 271 Digital Systems F | 4.25
- ENPH 334 Electronics for Applied Scientists F | 5
- CMPE 320 Fundamentals of Software Development F | 4
- ELEC 274 Computer Architecture W | 4
- ENPH 372 Thermodynamics W | 3.5

Fourth Year CORE 2018-2019

- ENPH 431 Electromagnetic Theory F | 3.5
- ENPH 454 Advanced Engineering Physics Design Project F | 4.5 **
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C or D F/W | 3
- Engineering Elective (any 200-, 300- or 400-level Engineering and Applied Science course) F/W | 3
- ENPH 455 Engineering Physics Thesis FW | 4 *
- ENPH 453 Advanced Physics Laboratory W | 3.5

Notes:

* Students may take (ENPH 456 and ENPH 457) as a combined alternate to ENPH 455, List "B" and Engineering Elective. See the description after 3rd year.

** Students may instead take APSC 480 Multi-disciplinary Industry Engineering Design Project (9 credits FW) as a substitute for ENPH 454 and one list "B" course. Note that APSC 480 has a prerequisite of APSC 381 or permission of the instructor.

One from Physics List A:

Physics List A:

- ENPH 317 Mathematical Methods in Physics II W | 3.5
- ENPH 321 Advanced Mechanics W | 3.5
- ENPH 414 Introduction to General Relativity F | 3
- ENPH 460 Laser Optics W | 3.5
- ENPH 472 Statistical Mechanics W | 3.5
- ENPH 480 Solid State Physics F | 3.5
- ENPH 483 Nanoscience and Nanotechnology W | 3.5

- ENPH 490 Nuclear Physics F | 3.5
- ENPH 491 Physics of Nuclear Reactors F | 3.5 ¹
- ENPH 495 Introduction to Medical Physics W | 3 ²

Note:

¹ ENPH 491 will be offered in 2017/2018 and alternate years thereafter.

² ENPH 495 will be offered in 2018/2019 and alternate years thereafter.

Electrical Sub-Plan (P1)

Two courses from Electrical List B, and one course from Electrical List B or Physics List A, at least one of which must be numbered above 400*:

Electrical List B:

- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 333 Electric Machines F | 4.5
- ELEC 344 Sensors and Actuators F | 3.25
- ELEC 373 Computer Networks W | 3
- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3
- ELEC 421 Digital Signal Processing: Filters and System Design F | 4
- ELEC 422 NOT OFFERED 2017-2018 - Digital Signal Processing: Random Models and Applications F | 3
- ELEC 431 Power Electronics F | 3.25
- ELEC 443 Linear Control Systems W | 4
- ELEC 448 Introduction to Robotics: Mechanics and Control W | 3.5
- ELEC 451 Digital Integrated Circuit Engineering F | 3
- ELEC 454 Analog Electronics W | 3.25
- ELEC 457 NOT OFFERED 2017-2018 - Integrated Circuits and System Applications W | 3
- ELEC 461 NOT OFFERED 2017-2018 - Digital Communications F | 3.5
- ELEC 464 Wireless Communications F | 3
- ELEC 474 Machine Vision W | 3.5
- ELEC 476 DELETED - Modelling and Systems Simulation W | 3.5
- ELEC 478 DELETED - Computer Networks II W | 3
- ELEC 483 NOT OFFERED 2017-2018 - Microwave and RF Circuits and Systems W | 4.5
- ELEC 486 NOT OFFERED THIS YEAR-Fiber Optic Communications F | 3.75
- CHEE 340 Biomedical Engineering W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Materials Sub-Plan (P3)

- ENPH 480 Solid State Physics F | 3.5

Materials List B:

Two courses from Materials List B*:

- MDEP 437 Fuel Cell Technology F |
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 470 Deformation Processing W | 3.5
- MECH 476 NOT OFFERED THIS YEAR-Engineering of Polymers and Composite Materials W | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 479 Nano-Structured Materials W | 3.5
- MECH 483 Nuclear Materials F | 3.5
- MECH 484 Introduction to Ceramics F | 3.5
- CHEE 340 Biomedical Engineering W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a list B course above with a list B course from one of the other options within Engineering Physics.

Mechanical Sub-Plan (P4)

Three courses: two from Mechanical List B, and one from Physics List A or Mechanical List B*:

Mechanical List B:

- CHEE 340 Biomedical Engineering W | 3.5
- MDEP 437 Fuel Cell Technology F |
- MECH 420 Vibrations W | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 424 NOT OFFERED THIS YEAR - Sustainable Product Design W | 3.5
- MECH 430 NOT OFFERED THIS YEAR-Thermal Systems Design F | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 Turbomachinery F | 3.5
- MECH 441 NOT OFFERED THIS YEAR - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow F | 3.5
- MECH 452 Mechatronics Engineering F | 5
- MECH 456 Introduction to Robotics F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 481 NOT OFFERED THIS YEAR-Wind Energy F | 3.5
- MECH 482 NOT OFFERED THIS YEAR-Noise Control W | 3.5
- MECH 492 Biofluids W | 3.5
- MECH 495 Ergonomics and Design W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Computing Sub-Plan (P6)

Three courses: two from Computing List B and one from Physics List A or Computing List B. At least one of the Computing List B courses must be numbered above 400*:

Computing List B:

- CHEE 340 Biomedical Engineering W | 3.5
- CMPE 330 Computer-Integrated Surgery F | 3
- CMPE 365 Algorithms I F | 4
- CMPE 452 Neural Networks and Genetic Algorithms W | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision F | 3
- CMPE 458 Programming Language Processors W | 4
- CMPE 472 Medical Informatics W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 374 Digital Systems Engineering W | 4.25 ¹
- ELEC 377 Operating Systems F | 4
- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3

Note:

¹With permission of the instructor.

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other sub-plans within Engineering Physics.

Complementary Studies:

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Engineering Physics Plan, the Engineering Economics course is APSC 221 , and the Communications requirements are met through courses in the core plan.

Engineering Physics, B.A.Sc. (Class of 2020)

Second Year CORE - 2017-2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- MTHE 227 Vector Analysis F | 3
- MTHE 237 Differential Equations for Engineering Science F | 3.25
- ENPH 242 Relativity and Quanta F | 3.5
- ELEC 221 Electric Circuits F | 4.25
- ENPH 211 Applied Physics W | 3.5

- ENPH 225 Mechanics W | 3.5
- ENPH 239 Electricity and Magnetism W | 3.5
- ENPH 252 Management of Experimental Data W | 1.25
- ENPH 253 Engineering Physics Laboratory W | K3.5
- ENPH 213 Computational Engineering Physics W | 4

Electrical Sub-Plan (P1)

- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 252 Electronics I W | 4.25

Materials Sub-Plan (P3)

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Mechanical Sub-Plan (P4)

- MECH 230 Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Computing Sub-Plan (P6)

- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4

Notes:

** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

Third Year CORE - 2018-2019

- MTHE 338 Fourier Methods for Boundary Value Problems F | 3.5 *
- ENPH 344 Introduction to Quantum Mechanics F | 3.5
- ENPH 354 Engineering Physics Design Project W | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- Complementary Studies, List A F/W | 3 **
- ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5
- ENPH 353 Engineering Physics Laboratory II F | 2.5

Notes:

* MTHE 338 may be replaced by taking both ENPH 316 and ENPH 317. ENPH 317 can be taken in 3rd or 4th year and is a Physics List A elective.

** Students are free to take Complementary Studies courses at any time in their program that suits their interests, workloads, and schedules. Read explanatory notes on Complementary Studies at the end of this section.

APSC 381 may be taken as a technical elective for students particularly interested in engineering design.

ENPH 491 and ENPH 495 are fourth year Physics List A electives offered every second year which students in their third year can consider taking.

Note: In February of Third Year students may apply for permission to take ENPH 456 and ENPH 457 as a combined alternate to (ENPH 455, a 4th year List "B" course, and the Engineering Elective), to facilitate an Accelerated Master's graduate degree ending 16 months after completion of the undergraduate Engineering Physics program. Details will be given in January of your 3rd year.

Electrical Sub-Plan (P1)

- ELEC 323 Continuous-Time Signals and Systems F | 3.75
- ELEC 353 Electronics II F | 4.5
- ENPH 372 Thermodynamics W | 3.5
- ELEC 324 Discrete-Time Signals and Systems W | 4
- ENPH 336 Solid State Devices W | 3.25

Materials Sub-Plan (P3)

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
- MECH 370 Principles of Materials Processing F | 3.5
- ENPH 334 Electronics for Applied Scientists F | 5
- ENPH 372 Thermodynamics W | 3.5
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Mechanical Sub-Plan (P4)

- ENPH 334 Electronics for Applied Scientists F | 5
- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5

Computing Sub-Plan (P6)

- ELEC 271 Digital Systems F | 4.25
- ENPH 334 Electronics for Applied Scientists F | 5
- CMPE 320 Fundamentals of Software Development F | 4
- ELEC 274 Computer Architecture W | 4
- ENPH 372 Thermodynamics W | 3.5

Fourth Year CORE - 2019-2020

- ENPH 431 Electromagnetic Theory F | 3.5
- ENPH 454 Advanced Engineering Physics Design Project F | 4.5 **
- Complementary Studies, List A F/W | 3 **
- Complementary Studies, List A, B, C or D F/W | 3 **
- Engineering Elective (any 200-, 300-, or 400-level Engineering and Applied Science course) F/W | 3
- ENPH 455 Engineering Physics Thesis FW | 4 *
- ENPH 453 Advanced Physics Laboratory W | 3.5

Note:

* Students may take (ENPH 456 and ENPH 457) as a combined alternate to ENPH 455, List "B" and Engineering Elective. See the description after 3rd year.

** Students may instead take APSC 480, Multi-disciplinary Industry Engineering Design Project (9 credits FW) as a substitute for ENPH 454 and one list "B" course. Note that APSC 480 has a prerequisite of APSC 381 or permission of the instructor.

One from Physics List A:

Physics List A:

- ENPH 317 Mathematical Methods in Physics II W | 3.5
- ENPH 321 Advanced Mechanics W | 3.5
- ENPH 414 Introduction to General Relativity F | 3
- ENPH 460 Laser Optics W | 3.5
- ENPH 472 Statistical Mechanics W | 3.5
- ENPH 480 Solid State Physics F | 3.5
- ENPH 483 Nanoscience and Nanotechnology W | 3.5
- ENPH 490 Nuclear Physics F | 3.5
- ENPH 491 Physics of Nuclear Reactors F | 3.5 ¹
- ENPH 495 Introduction to Medical Physics W | 3 ²

Note:

¹ ENPH 491 will be offered in 2017/2018 and alternate years thereafter.

² ENPH 495 will be offered in 2018/2019 and alternate years thereafter.

Electrical Sub-Plan (P1)

Two courses from Electrical List B, and one course from Electrical List B or Physics List A, at least one of which must be numbered above 400*:

- ENPH 336 Solid State Devices W | 3.25

Electrical List B:

- ELEC 326 Probability and Random Processes F | 3.5
- ELEC 333 Electric Machines F | 4.5
- ELEC 344 Sensors and Actuators F | 3.25
- ELEC 373 Computer Networks W | 3
- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3
- ELEC 421 Digital Signal Processing: Filters and System Design F | 4
- ELEC 422 NOT OFFERED 2017-2018 - Digital Signal Processing: Random Models and Applications F | 3
- ELEC 431 Power Electronics F | 3.25
- ELEC 443 Linear Control Systems W | 4
- ELEC 448 Introduction to Robotics: Mechanics and Control W | 3.5
- ELEC 451 Digital Integrated Circuit Engineering F | 3
- ELEC 454 Analog Electronics W | 3.25
- ELEC 457 NOT OFFERED 2017-2018 - Integrated Circuits and System Applications W | 3
- ELEC 461 NOT OFFERED 2017-2018 - Digital Communications F | 3.5
- ELEC 464 Wireless Communications F | 3
- ELEC 476 DELETED - Modelling and Systems Simulation W | 3.5
- ELEC 478 DELETED - Computer Networks II W | 3
- ELEC 483 NOT OFFERED 2017-2018 - Microwave and RF Circuits and Systems W | 4.5
- ELEC 486 NOT OFFERED THIS YEAR-Fiber Optic Communications F | 3.75
- CHEE 340 Biomedical Engineering W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Materials Sub-Plan (P3)

- ENPH 480 Solid State Physics F | 3.5

Materials List B:

Two courses from Materials List B*:

- MDEP 437 Fuel Cell Technology F |
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 470 Deformation Processing W | 3.5
- MECH 476 NOT OFFERED THIS YEAR-Engineering of Polymers and Composite Materials W | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 479 Nano-Structured Materials W | 3.5
- MECH 483 Nuclear Materials F | 3.5
- MECH 484 Introduction to Ceramics F | 3.5
- CHEE 340 Biomedical Engineering W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a list B course above with a list B course from one of the other options within Engineering Physics.

Mechanical Sub-Plan (P4)

Three courses: two from Mechanical List B, and one from Physics List A or Mechanical List B*:

Mechanical List B:

- CHEE 340 Biomedical Engineering W | 3.5
- MDEP 437 Fuel Cell Technology F |
- MECH 420 Vibrations W | 3.5
- MECH 423 Introduction to Microsystems W | 3.5
- MECH 424 NOT OFFERED THIS YEAR - Sustainable Product Design W | 3.5
- MECH 430 NOT OFFERED THIS YEAR-Thermal Systems Design F | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 Turbomachinery F | 3.5
- MECH 441 NOT OFFERED THIS YEAR - Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics F | 3.5
- MECH 448 Compressible Fluid Flow F | 3.5
- MECH 452 Mechatronics Engineering F | 5
- MECH 456 Introduction to Robotics F | 3.5
- MECH 465 Computer-Aided Design F | 3.5
- MECH 480 Airplane Aerodynamics and Performance W | 3.5
- MECH 481 NOT OFFERED THIS YEAR-Wind Energy F | 3.5
- MECH 482 NOT OFFERED THIS YEAR-Noise Control W | 3.5
- MECH 492 Biofluids W | 3.5
- MECH 495 Ergonomics and Design W | 3.5

Note:

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other options within Engineering Physics.

Computing Sub-Plan (P6)

Three courses: two from Computing List B and one from Physics List A or Computing List B. At least one of the Computing List B courses must be numbered above 400*:

Computing List B:

- CHEE 340 Biomedical Engineering W | 3.5
- CMPE 330 Computer-Integrated Surgery F | 3
- CMPE 365 Algorithms I F | 4
- CMPE 452 Neural Networks and Genetic Algorithms W | 3
- CMPE 454 Computer Graphics W | 3
- CMPE 457 Image Processing and Computer Vision F | 3
- CMPE 458 Programming Language Processors W | 4

- CMPE 472 Medical Informatics W | 3
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- ELEC 374 Digital Systems Engineering W | 4.25 ¹
- ELEC 377 Operating Systems F | 4
- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3

Note:

¹With permission of the instructor.

* Students with the necessary prerequisites and/or permission of the instructor may replace a List B course above with a List B course from one of the other sub-plans within Engineering Physics.

Complementary Studies:

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Engineering Physics Plan, the Engineering Economics course is APSC 221, and the Communications requirements are met through courses in the core plan.

Geological Engineering

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Geological Engineering is a broad and creative field of engineering which combines practical application of geological principles, concepts and techniques with engineering investigation, analysis and design, providing reliable and sustainable engineered solutions to human needs.

Geological Engineering at Queen's University prepares students for the creative problem solving, analysis, interpretation and decision making necessary to tackle engineering challenges related to:

- Design and application of advanced surface and subsurface investigation, field and lab data interpretation, advanced analysis and geological modelling in aid of engineering design;
- Environmental engineering including subsurface water resource exploration and protection, ground contaminant remediation, sustainable mine/urban/industrial waste management/engineering;
- Geotechnical engineering and construction on, with or through earth materials (rock and soil) including tunnels, caverns, mines, transportation infrastructure, foundations, dams, waste storage;
- Geo-hazard assessment and risk mitigation including landslides, subsidence, earthquakes and floods;
- Mineral and energy resource exploration, evaluation, development and sustainable management, including environmental protection and remediation before, during and after geo-resource extraction;

- Applied Geophysics (eg. Seismics, electro-magnetics, gravity, laser, radar, etc) for remote probing (from the ground or from space) and visualization of the subsurface environment to facilitate geotechnical, geo-hazard, geo-environmental or geo-resource engineering.

The academic plan provides an enhanced understanding of the geological model associated with a particular challenge from the list above allowing in-depth assessment and understanding of the engineering properties of earth materials, including natural variability within and between different environments, sensitivity of these materials to genesis and tectonic history, the changes to earth materials with time within an engineering context, and the impacts on the reliability and sustainability of design solutions.

The Geological Engineering plan offers a common second year curriculum, to provide students with a foundation in geological sciences, math and physics in addition to broad introductory exposure to a variety of geo-engineering problems and design approaches. The extensive and well-rounded core program offered in third and fourth year is augmented by a number of technical elective choices. This allows each student to gain in-depth specialization by taking several courses in an area of interest, geotechnical engineering, geo-environmental engineering, including mineral and energy exploration, or geophysics. Alternatively, a student can choose to build a breadth of knowledge across the discipline of Geological Engineering.

Geological Engineering Curriculum

It is recommended that students consult the academic advisor at least once in each year of their plan, to ensure that they are taking the required number of Technical Electives and Complementary Studies courses to fulfill the academic plan requirements as well as those of the Canadian Engineering Accreditation Board. Students need to plan ahead to ensure that they take courses in the appropriate years along with the necessary prerequisites.

Revisions to the Geological Engineering plan are ongoing. There are separate sections for the Classes of 2017, 2018, and 2019. Please refer to the appropriate calendar for your year of graduation.

The Technical Elective (TE) List is given at the end of this section. Complementary Studies (CE) are discussed at the end of each year calendar entry. For the classes of 2018 and 2019, students may take elective courses (4 TE and 3 CE) in any of the elective slots available in the 3rd and 4th years of the plan. For the class of 2017, a total of 5 TE and 3 CE are required.

Field Work

Field work is an essential part of Geological Engineering training, both to gain field skills and to understand the sources and nature of the data to be used for analysis and design. Field trips and field projects are offered in each year of study because the Department wishes to provide the best experience-based education possible. Employers and alumni from the Department are universally enthusiastic about the value of this component of the Geological Engineering plan. In accordance with University policies, students will receive specialized instruction in field safety.

A field skills course, with trips around the Kingston area, is undertaken during the fall term of second year. A two-week Geological Engineering field school is held in the spring immediately following final exams. Students are expected to take this course at the end of their second year. This course requires teams of students to design and carry out geological and engineering site investigations related to specific geological engineering problems. Core field courses in fourth year deal either with engineering and design issues related to geo-environmental, geotechnical and resource management issues within the mineral industry, or with engineering site investigation design using applied geophysics.

The cost of field trips and courses, including transportation, accommodation and food (when it is supplied), will be borne by the student. A list of the field education costs for each course is provided on the departmental web page (<http://www.queensu.ca/geol/undergrad/field-trips>).

These costs are subject to change, and will be finalized by June 1 each year for the following academic year. These costs will be payable by the due dates listed in the table. Subsidies will be provided by the Department when funding permits.

Students may incur additional field trip costs for courses they elect to take as a part of their degree. Students should consult with course instructors regarding these costs before registering in courses with a field trip component.

Geological Engineering, B.A.Sc. (Class of 2018)

Second Year Common Core – 2015/16 (Class of 2018 Only)

- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- GEOE 221 Geological Engineering Field Methods F | 4.5
- GEOE 232 Mineralogy F | 4.5
- GEOE 281 Earth Systems Engineering F | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 *
- APSC 200 Engineering Design and Practice II F/W | K4 *
- APSC 293 Engineering Communications I F/W | K1 *
- GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- GEOE 249 Geophysical Characterization of the Earth W | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5 *

*Note: Students in GEOE take APSC 221 in the Fall Term and APSC 200, 293 and MTHE 225 in the Winter term

Intersession (Taken in Spring following 2nd Year)

- GEOE 300 Geological Engineering Field School S | 5

Third Year Common Core – 2016/17 (Class of 2018 only)

- GEOE 321 Analysis of Rock Structures F | 4
- CIVL 340 Geotechnical Engineering I F | 3.75
- **Take ONE of GEOE 343 or CIVL 371 as Core (* below)**
- * GEOE 343 NOT OFFERED THIS YEAR-Applied Hydrogeology F | 3.75
- * CIVL 371 Groundwater Engineering F | 3.75
- GEOE 365 Geochemical Characterization of the Earth F | 3.75
- GEOE 359 Applied Quantitative Analysis in Geological Engineering W | 3.5
- GEOE 362 Resource Engineering W | 4.5
- GEOE 319 Applied Geophysics W | 4.5
- GEOE 333 Terrain Evaluation W | 4
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- Elective F/W | 3
- Elective F/W | 3

Fourth Year Common Core- 2017/18 (Class of 2018 only)

- GEOE 207 History of Life F | 3.5 (can be taken in 3rd or 4th year)
- GEOE 413 Geomechanics and Rock Engineering Design F | 3.5
- **Take ONE of GEOE 410 or GEOE 419 as Core (* below)**
- * GEOE 410 Geological Engineering Field School F | 3.5
- * GEOE 419 Engineering Geophysics Field School S | 3.5
- GEOE 446 Engineering Design Project I F | K3
- GEOE 447 Engineering Design Project II W | K5
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3

Electives (Classes of 2018-2019)

The Geological Engineering plans for the Classes of 2018 & 2019 require that each student take FOUR Technical Electives (TE) from the list at the end of this section, and THREE Complementary Studies Electives (CE) (below). These courses can be taken at any point during the program to accommodate timetabling but normally only in third and fourth year. Students should plan to ensure that prerequisite and co-requisite requirements are met for the full suite of TE or CE electives they wish to take during their program. Students should note that a reduction of total course load to less than 80% of the normal load may prevent them from holding Queen's University scholarships. Note that GEOE 207 may be taken in either 3rd or 4th year. With the exceptions of CHEE 400 and APSC 480, which each count for two TE's, all technical electives in the TE list count for one of the four required TE courses regardless of credit value.

Geological Engineering: Technical Electives

Complementary Studies

Refer to the Complementary Studies section of this calendar for courses that may be taken for all Engineering programs. For the Geological Engineering Program, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 in addition to first year program and the three Complementary Studies courses (as above): 2 from List A and 1 from Lists A,B,C, or D.

Geological Engineering, B.A.Sc. (Class of 2019)

Second Year CORE 2016-2017

- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- GEOE 221 Geological Engineering Field Methods F | 4.5
- GEOE 232 Mineralogy F | 4.5
- GEOE 281 Earth Systems Engineering F | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 *
- APSC 200 Engineering Design and Practice II F/W | K4 *
- APSC 293 Engineering Communications I F/W | K1 *
- GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- GEOE 249 Geophysical Characterization of the Earth W | 3.5

- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5 *
- *Note: Students in GEOE take APSC 221 in the Fall Term and APSC 200, 293 and MTHE 225 in the Winter term

Intersession (Taken in Spring following 2nd Year)

- GEOE 300 Geological Engineering Field School S | 5

Third Year CORE 2017-2018

- GEOE 321 Analysis of Rock Structures F | 4
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 371 Groundwater Engineering F | 3.75
- GEOE 365 Geochemical Characterization of the Earth F | 3.75
- GEOE 359 Applied Quantitative Analysis in Geological Engineering W | 3.5
- GEOE 362 Resource Engineering W | 4.5
- GEOE 319 Applied Geophysics W | 4.5
- GEOE 333 Terrain Evaluation W | 4
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- Elective F/W | 3
- Elective F/W | 3

Fourth Year CORE 2018-2019

- GEOE 207 History of Life F | 3.5
- GEOE 313 Geomechanics and Engineering Geology W | 3
- **Take ONE of GEOE 410 or GEOE 419 as Core (* below)**
- * GEOE 410 Geological Engineering Field School F | 3.5
- * GEOE 419 Engineering Geophysics Field School S | 3.5
- GEOE 446 Engineering Design Project I F | K3
- GEOE 447 Engineering Design Project II W | K5
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3

Electives (Classes of 2018 and 2019)

The Geological Engineering plans for the Classes of 2018 & 2019 require that each student take FOUR Technical Electives (TE) from the list at the end of this section, and THREE Complementary Studies Electives (CE) (below). These courses can be taken at any point during the program to accommodate timetabling but normally only in third and fourth year. Students should plan to ensure that prerequisite and co-requisite requirements are met for the full suite of TE or CE electives they wish to take during their program. Students should note that a reduction of total course load to less than 80% of the normal load may prevent them from holding Queen's University scholarships. Note that GEOE 207 may be taken in either 3rd or 4th year. With the exceptions of CHEE 400 and APSC 480, which each count for two TE's, all technical electives in the TE list count for one of the four required TE courses regardless of credit value.

Geological Engineering: Technical Electives

Complementary Studies

Refer to the Complementary Studies section of this calendar for courses that may be taken for all Engineering programs. For the Geological Engineering Program, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 in addition to first year program and the three Complementary Studies courses (as above): 2 from List A and 1 from Lists A,B,C, or D.

Geological Engineering, B.A.Sc. (Class of 2020)

Second Year CORE – 2017-2018

- CHEE 209 Analysis of Process Data F | 3.5
- CIVL 230 Solid Mechanics I F | 4.25
- GEOE 207 History of Life F | 3.5
- GEOE 221 Geological Engineering Field Methods F | 4.5
- GEOE 232 Mineralogy F | 4.5
- GEOE 281 Earth Systems Engineering F | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3 *
- APSC 200 Engineering Design and Practice II F/W | K4 *
- APSC 293 Engineering Communications I F/W | K1 *
- GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- GEOE 249 Geophysical Characterization of the Earth W | 3.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5 *

*Note: Students in GEOE take APSC 221, APSC 200, 293 and MTHE 225 in the Winter term.

Intersession (Taken in Spring following 2nd Year)

- GEOE 300 Geological Engineering Field School S | 5

Third Year CORE – 2018-2019

- GEOE 321 Analysis of Rock Structures F | 4
- CIVL 340 Geotechnical Engineering I F | 3.75
- CIVL 371 Groundwater Engineering F | 3.75
- GEOE 365 Geochemical Characterization of the Earth F | 3.75
- GEOE 313 Geomechanics and Engineering Geology W | 3
- GEOE 319 Applied Geophysics W | 4.5
- GEOE 333 Terrain Evaluation W | 4
- GEOE 359 Applied Quantitative Analysis in Geological Engineering W | 3.5 *
- GEOE 362 Resource Engineering W | 4.5
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- Elective F/W | 3
- Elective F/W | 3

*Note: GEOE359 will be taught in the fall term in 2018-2019

Fourth Year CORE - 2019-2020

GEOE 410 or GEOE 419 will be taken prior to the start of fourth year at the end of August

Take ONE of GEOE 410 or GEOE 419 as Core (* below)

- GEOE 410 Geological Engineering Field School F | 3.5 *
- GEOE 419 Engineering Geophysics Field School S | 3.5 *
- GEOE 446 Engineering Design Project I F | K3
- GEOE 447 Engineering Design Project II W | K5
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3

Electives (Classes of 2019 and 2020)

The Geological Engineering plans for the Classes of 2019 & 2020 require that each student take FOUR Technical Electives (TE) from the list at the end of this section, and THREE Complementary Studies Electives (CE) (below). These courses can be taken at any point during the program to accommodate timetabling but normally only in third and fourth year. Students should plan to ensure that prerequisite and co-requisite requirements are met for the full suite of TE or CE electives they wish to take during their program. Students should note that a reduction of total course load to less than 80% of the normal load may prevent them from holding Queen's University scholarships. With the exceptions of CHEE 400 and APSC 480, which each count for two TE's, all technical electives in the TE list count for one of the four required TE courses regardless of credit value.

Geological Engineering: Technical Electives

Complementary Studies

Refer to the Complementary Studies section of this calendar for courses that may be taken for all Engineering programs. For the Geological Engineering Program, the Engineering Economics course is APSC 221, and the Communications course is APSC 293 in addition to first year program and the three Complementary Studies courses (as above): 2 from List A and 1 from Lists A,B,C, or D.

Mathematics and Engineering

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This plan was developed at Queen's in response to the need for engineers who possess the skills and insights of applied mathematicians. In the second and third years of the plan, half of the curriculum consists of honours courses in pure and applied mathematics; the balance consists of engineering courses in one of three sub-plans offered in cooperation with the departments of Mechanical, Electrical and Computer

Engineering, and the School of Computing. The sub-plans are developed with appropriate applications of mathematics to engineering in the final year. The sub-plans are:

(M6) APPLIED MECHANICS: (mechanics, dynamics, fluid mechanics, thermodynamics)

(M9) COMPUTING AND COMMUNICATIONS: (computer science, software design, communication, information systems, and electrical engineering)

(M11) SYSTEMS AND ROBOTICS: (electrical and mechanical engineering, control, communications, information systems, robotics, and mechanics)

Options available:

- Applied Mechanics Option
- Computing and Communications Option
- Systems and Robotics Option

Mathematics and Engineering, B.A.Sc. (Class of 2018)

Second Year Common Core - 2015/2016

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- MTHE 217 Algebraic Structures with Applications F | 3.5
- MTHE 237 Differential Equations for Engineering Science F | 3.25
- MTHE 280 Advanced Calculus F | 3.5
- MTHE 281 Introduction to Real Analysis W | 3.5
- MTHE 212 Linear Algebra W | 3.5

Applied Mechanics Sub-Plan (M6)

- MECH 221 Solid Mechanics I F/S-OL | 4
- MECH 230 Thermodynamics I F | 3.5
- ENPH 252 Management of Experimental Data W | 1.25
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Minimum Total Credits: 42.25

Computing and Communications Sub-Plan (M9)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 252 Electronics I W | 4.25
- ELEC 274 Computer Architecture W | 4
- ENPH 239 Electricity and Magnetism W | 3.5

Minimum Total Credits: 42.5

Systems and Robotics Sub-Plan (M11)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ENPH 225 Mechanics W | 3.5
- ELEC 252 Electronics I W | 4.25
- ELEC 274 Computer Architecture W | 4

Minimum Total Credits: 42.5

Third Year Common Core - 2016/2017

- MTHE 326 Functions of a Complex Variable F | 3.5
- MTHE 332 Introduction to Control W | 4
- MTHE 334 Mathematical Methods for Engineering and Physics F | 3.5
- MTHE 335 Mathematics of Engineering Systems W | 3.5
- MTHE 393 Engineering Design and Practice for Mathematics and Engineering W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3

Applied Mechanics Sub-Plan (M6)

- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 323 Machine Design W | 4.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 44.5

NOTE: Students intending to take MECH 452 in fourth year should take the Technical Elective ELEC 310 in third year and delay APSC 221 until fourth year.

Computing and Communications Sub-Plan (M9)

- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- MTHE 351 Probability I F | 3.5
- Complementary Studies, List A F/W | 3
- CMPE 212 Introduction to Computing Science II F/W | 4
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.75

Systems and Robotics Sub-Plan (M11)

- MTHE 351 Probability I F | 3.5
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- Complementary Studies, List A F | 3
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.25

Fourth Year Common Core - 2017/2018

- MTHE 494 Mathematics and Engineering Seminar F | 3
- MTHE 493 Engineering Mathematics Project FW* | K7.5

Applied Mechanics Sub-Plan (M6)

- MTHE 430 Modern Control Theory F | 4
- MTHE 351 Probability I F | 3.5
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C, or D W | 3
- MTHE 439 Lagrangian Mechanics, Dynamics, and Control W | 3.5

Elective

M6 students must choose 4 technical electives: a minimum of one (1) technical elective must be taken from List I; and the remaining from List II, subject to the requirement that the elective selection satisfies the following two criteria:

1. the selection exceeds the minimum of 40 Accreditation Units (AUs) in Engineering Design (ED) and
2. the selection exceeds the minimum of 120 AUs in Engineering Design + Engineering Science (ES+ED).

PLEASE NOTE: the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.

Mathematics and Engineering, Applied Mechanics: Technical Electives

Minimum Total Credits: 42.5

Computing and Communications Sub-Plan (M9)

- CMPE 365 Algorithms I F | 4
- MTHE 474 Information Theory F | 3
- MTHE 455 Stochastic Processes and Applications F | 3.5
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C or D F/W | 3
- MTHE 477 Data Compression and Source Coding W | 3

Elective

M9 students must choose 4 technical electives: a minimum of two (2) technical electives must be taken from List I; and the remaining from List II.

PLEASE NOTE: *the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.*

Mathematics and Engineering, Computing and Communications: Technical Electives

Minimum Total Credits: 42

Systems and Robotics Sub-Plan (M11)

- MTHE 430 Modern Control Theory F | 4
- MTHE 472 Control of Stochastic Systems W | 3
- MTHE 474 Information Theory F | 3
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C or D F/W | 3

Elective

M11 students must choose 4 technical electives: a minimum of two (2) technical electives must be taken from List I; and the remaining from List II.

PLEASE NOTE: *the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.*

Mathematics and Engineering, Systems and Robotics: Technical Electives

Minimum Total Credits: 38.5

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Mathematics and Engineering Program, the Engineering Economics course is APSC 221, and the Communications requirements are met through courses taken in the core program (MTHE 393, MTHE 494, MTHE 493 and APSC 293)

Mathematics and Engineering, B.A.Sc. (Class of 2019)

Second Year CORE 2016-2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- MTHE 217 Algebraic Structures with Applications F | 3.5

- MTHE 237 Differential Equations for Engineering Science F | 3.25
- MTHE 280 Advanced Calculus F | 3.5
- MTHE 212 Linear Algebra W | 3.5
- MTHE 281 Introduction to Real Analysis W | 3.5

Applied Mechanics Sub-Plan (M6)

- MECH 221 Solid Mechanics I F/S-OL | 4
- MECH 230 Thermodynamics I F | 3.5
- ENPH 252 Management of Experimental Data W | 1.25
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Minimum Total Credits: 42.25

Computing and Communications Sub-Plan (M9)

- ELEC 271 Digital Systems F | 4.25
- ELEC 274 Computer Architecture W | 4
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 239 Electricity and Magnetism W | 3.5

Minimum Total Credits: 42

Systems and Robotics Sub-Plan (M11)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ENPH 225 Mechanics W | 3.5
- ELEC 252 Electronics I W | 4.25
- ELEC 274 Computer Architecture W | 4

Minimum Total Credits: 42.5

Third Year CORE 2017-2018

- MTHE 326 Functions of a Complex Variable F | 3.5
- MTHE 332 Introduction to Control W | 4
- MTHE 334 Mathematical Methods for Engineering and Physics F | 3.5
- MTHE 335 Mathematics of Engineering Systems W | 3.5
- MTHE 393 Engineering Design and Practice for Mathematics and Engineering W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3

Applied Mechanics Sub-Plan (M6)

- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 323 Machine Design W | 4.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 45

Note:

Students intending to take MECH 452 in fourth year should take the Technical Elective ELEC 310 in third year and delay APSC 221 until fourth year.

Computing and Communications Sub-Plan (M9)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- MTHE 351 Probability I F | 3.5
- Complementary Studies, List A F/W | 3
- ELEC 252 Electronics I W | 4.25
- MTHE 353 Probability II W | 3

Minimum Total Credits: 43.75

Systems and Robotics Sub-Plan (M11)

- MTHE 351 Probability I F | 3.5
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- Complementary Studies, List A F | 3
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.75

Fourth Year CORE 2018-2019

- MTHE 494 Mathematics and Engineering Seminar F | 3
- MTHE 493 Engineering Mathematics Project FW* | K7.5

Applied Mechanics Sub-Plan (M6)

- MTHE 430 Modern Control Theory F | 4
- MTHE 351 Probability I F | 3.5
- Complementary Studies, List A F/W | 3

- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C, or D W | 3
- MTHE 439 Lagrangian Mechanics, Dynamics, and Control W | 3.5

Electives

M6 students must choose 4 technical electives: a minimum of one (1) technical elective must be taken from List I; and the remaining from List II, subject to the requirement that the elective selection satisfies the following two criteria:

1. the selection exceeds the minimum of 40 Accreditation Units (AUs) in Engineering Design (ED) and
2. the selection exceeds the minimum of 120 AUs in Engineering Design + Engineering Science (ES+ED).

PLEASE NOTE: the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.

Mathematics and Engineering, Applied Mechanics: Technical Electives

Minimum Total Credits: 42.5

Computing and Communications Sub-Plan (M9)

- CMPE 365 Algorithms I F | 4
- MTHE 474 Information Theory F | 3
- MTHE 455 Stochastic Processes and Applications F | 3.5
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C or D F/W | 3
- MTHE 477 Data Compression and Source Coding W | 3

Electives

M9 students must choose 4 technical electives: a minimum of two (2) technical electives must be taken from List I; and the remaining from List II.

PLEASE NOTE: the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.

Mathematics and Engineering, Computing and Communications: Technical Electives

Minimum Total Credits: 42

Systems and Robotics Sub-Plan (M11)

- MTHE 430 Modern Control Theory F | 4
- MTHE 474 Information Theory F | 3
- MTHE 472 Control of Stochastic Systems W | 3

- Complementary Studies, List A F/W | 3
Complementary Studies, List A, B, C or D F/W | 3

Electives

M11 students must choose 4 technical electives: a minimum of two (2) technical electives must be taken from List I; and the remaining from List II.

PLEASE NOTE: *the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.*

Mathematics and Engineering, Systems and Robotics: Technical Electives

Minimum Total Credits: 38.5

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Mathematics and Engineering Program, the Engineering Economics course is APSC 221 , and the Communications requirements are met through courses taken in the core program (MTHE 393 , MTHE 494 , MTHE 493 and APSC 293

Mathematics and Engineering, B.A.Sc. (Class of 2020)

Second Year Common Core - 2017/2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- MTHE 217 Algebraic Structures with Applications F | 3.5
- MTHE 237 Differential Equations for Engineering Science F | 3.25
- MTHE 280 Advanced Calculus F | 3.5
- MTHE 212 Linear Algebra W | 3.5
- MTHE 281 Introduction to Real Analysis W | 3.5

Applied Mechanics Sub-Plan (M6)

- MECH 221 Solid Mechanics I F/S-OL | 4
- MECH 230 Thermodynamics I F | 3.5
- ENPH 252 Management of Experimental Data W | 1.25
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Minimum Total Credits: 42.25

Computing and Communications Sub-Plan (M9)

- ELEC 271 Digital Systems F | 4.25
- ELEC 274 Computer Architecture W | 4
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ENPH 239 Electricity and Magnetism W | 3.5

Minimum Total Credits: 42

Systems and Robotics Sub-Plan (M11)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ENPH 225 Mechanics W | 3.5
- ELEC 252 Electronics I W | 4.25
- ELEC 274 Computer Architecture W | 4

Minimum Total Credits: 42.75

Third Year Common Core - 2018/2019

- MTHE 326 Functions of a Complex Variable F | 3.5
- MTHE 332 Introduction to Control W | 4
- MTHE 334 Mathematical Methods for Engineering and Physics F | 3.5
- MTHE 335 Mathematics of Engineering Systems W | 3.5
- MTHE 393 Engineering Design and Practice for Mathematics and Engineering W | K4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3

Applied Mechanics Sub-Plan (M6)

- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 323 Machine Design W | 4.5
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 45

NOTE: Students intending to take MECH 452 in fourth year should take the Technical Elective ELEC 310 in third year and delay APSC 221 until fourth year.

Computing and Communications Sub-Plan (M9)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- MTHE 351 Probability I F | 3.5

- Complementary Studies, List A F/W | 3
- ELEC 252 Electronics I W | 4.25
- MTHE 353 Probability II W | 3

Minimum Total Credits: 43.75

Systems and Robotics Sub-Plan (M11)

- MTHE 351 Probability I F | 3.5
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25
- Complementary Studies, List A F | 3
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.75

Fourth Year Common Core - 2019/2020

- MTHE 494 Mathematics and Engineering Seminar F | 3
- MTHE 493 Engineering Mathematics Project FW* | K7.5

Applied Mechanics Sub-Plan (M6)

- MTHE 430 Modern Control Theory F | 4
- MTHE 351 Probability I F | 3.5
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C, or D W | 3
- MTHE 439 Lagrangian Mechanics, Dynamics, and Control W | 3.5

Electives

M6 students must choose 4 technical electives: a minimum of one (1) technical elective must be taken from List I; and the remaining from List II, subject to the requirement that the elective selection satisfies the following two criteria:

1. the selection exceeds the minimum of 40 Accreditation Units (AUs) in Engineering Design (ED) and
2. the selection exceeds the minimum of 120 AUs in Engineering Design + Engineering Science (ES+ED).

PLEASE NOTE: the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.

Mathematics and Engineering, Applied Mechanics: Technical Electives

Minimum Total Credits: 42.5

Computing and Communications Sub-Plan (M9)

- CMPE 365 Algorithms I F | 4
- MTHE 474 Information Theory F | 3
- MTHE 455 Stochastic Processes and Applications F | 3.5
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C or D F/W | 3
- MTHE 477 Data Compression and Source Coding W | 3

Electives

M9 students must choose 4 technical electives: a minimum of two (2) technical electives must be taken from List I; and the remaining from List II.

PLEASE NOTE: the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.

Mathematics and Engineering, Computing and Communications: Technical Electives

Minimum Total Credits: 42

Systems and Robotics Sub-Plan (M11)

- MTHE 430 Modern Control Theory F | 4
- MTHE 474 Information Theory F | 3
- MTHE 472 Control of Stochastic Systems W | 3
- Complementary Studies, List A F/W | 3
- Complementary Studies, List A, B, C or D F/W | 3

Electives

M11 students must choose 4 technical electives: a minimum of two (2) technical electives must be taken from List I; and the remaining from List II.

PLEASE NOTE: the term in which a course is offered can change from one academic year to the next. This can occur due to instructor availability or a change to departmental resources. Please refer to the on-line Course Timetable to determine the terms in which the courses in this Technical Elective section will be offered.

Mathematics and Engineering, Systems and Robotics: Technical Electives

Minimum Total Credits: 38.5

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Mathematics and Engineering Program, the Engineering Economics course

is APSC 221, and the Communications requirements are met through courses taken in the core program (MTHE 393, MTHE 494, MTHE 493 and APSC 293).

Mechanical Engineering

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2nd Year Program Coordinator: Y-J. Lai

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The second year curriculum is common to all sub-plans, but prior to or during the second year, students select from the following options (sub-plans) for their third year: General (ME1) allows students to select technical electives from a variety of specialized areas of study; Materials (ME2) includes courses in materials and metallurgical engineering; or Biomechanical (ME3) includes courses in the biomechanical field. Note that with the wide variety of courses offered, the Department cannot guarantee all courses are conflict free or offered each calendar year, particularly for students who choose to transfer or change options in their third or fourth year. Transferring programs could also result in extending the length of the program beyond the typical 4 years.

Students are invited to participate in one of the international design competition teams such as the Autonomous Sailboat Team (MAST), Baja SAE Team, Formula SAE Team, SAE Aero Design Team, ECO Vehicle Design Team, Fuel Cell Design Team or the Solar Design Team.

Options available:

- Materials Option
- Biomechanical Option

Mechanical and Materials Engineering, B.A.Sc. (Class of 2018)

Second Year Common Core- 2015/2016

- MECH 221 Solid Mechanics I F/S-OL | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- MECH 213 Manufacturing Methods F | 4.5
- MECH 230 Thermodynamics I F | 3.5
- MECH 215 -NOT OFFERED IN 2017-2018 - Instrumentation and Measurement F | 3.5
- MECH 270 Materials Science and Engineering F | 3.75
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MTHE 272 Application of Numerical Methods W | 3.5
- MECH 216 NOT OFFERED IN 2017-2018 - Instrumentation and Measurement Labs F | K2
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Minimum Total Credits: 44.5

Note: Students should be aware that a transfer or a change in option choice may result in their program requirements taking more than the typical 4 years because of course availability and conflicts in their core timetable. The department cannot guarantee that courses will not conflict when a student changes options or transfers, especially after 2nd year.

MME students normally take APSC 200/293 in the winter term.

Third Year Common Core- 2016/2017

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- ELEC 310 Introductory Analog Electronic and Digital Circuits F | 4.5
- MECH 323 Machine Design W | 4.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5
- MTHE 367 Engineering Data Analysis W | 3.5

Note: MECH 396 and MECH 397 require MECH 370 and MECH 371 as co-requisites which would be additional courses in the third year for students in the ME1 or ME3 options.

General Sub-Plan (ME1)

- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
OR
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2
OR
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Materials Sub-Plan (ME2)

- MECH 370 Principles of Materials Processing F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Biomechanical Sub-Plan (ME3)

- CHEE 340 Biomedical Engineering W | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
OR
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 393 Biomechanical Product Development F | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2
OR
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Fourth Year Common Core- 2017/2018

- Complementary Studies, List A, F, or W | 6
- Complementary Studies, List A, B, C, or D, F or W | 3
- ME1 and ME2 Technical Electives (See Technical Elective List) F and W | 23.5
- ME3 Technical Electives (See Technical Elective List) F and W | 20

Important to Note: Students must have a minimum total of 23.5 credits of Technical Electives in the ME1 and ME2 options, and a minimum total of 20 credits of Technical Electives in the ME3 option. This count includes any non-core technical electives or free electives taken in a student's 2nd, 3rd and 4th years from the specific lists required for their option which are outlined in the Technical Elective description.

General Sub-Plan (ME1) Core

- MECH 460 Team Project - Conceive and Design F | K4 *
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

Materials Sub-Plan (ME2) Core

- MECH 460 Team Project - Conceive and Design F | K4 *
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

Biomechanical Sub-Plan (ME3) Core

- MECH 460 Team Project - Conceive and Design F | K4 *
AND
- MECH 462 Team Project - Implement and Operate W | K3.5 *
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

* Capstone Design Course

All students must take a final year capstone design course in their program. For the ME1 and ME2 option students this course would normally be MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall). ME3 students will normally take MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall) in addition to MECH 462 (3.5 credits, Winter).

However, students in the ME1 and ME2 options may choose to take APSC 480 (9 credits, Fall and Winter), Multi-disciplinary Industry Engineering Design Project as a substitute for MECH 460 and MECH 464, and will receive 3.5 credits of List 1 technical electives that will count towards their required minimum technical elective credit count.

ME3 students may choose to take APSC 480 (9 credits, FW) as a substitute for MECH 460, MECH 464, and MECH 462.

Note that APSC 480 has a prerequisite of APSC 381, normally taken in the winter term of third year.

Important Note: All students who want to take APSC 480 must make sure they **DROP** MECH 460, MECH 464, and MECH 462 from their pre-loaded courses on SOLUS, and **ADD** APSC 480. All students are limited to taking only **ONE** final year capstone project course, either MECH 460 or APSC 480.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Mechanical Program, the Engineering Economics core course is APSC 221, and the Communications core courses are APSC 293 and MECH 464 (or APSC 480).

Technical Electives

Mechanical and Materials Engineering: Technical Electives

Mechanical and Materials Engineering, B.A.Sc. (Class of 2019)

Second Year CORE 2016-2017

- MECH 221 Solid Mechanics I F/S-OL | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- MECH 213 Manufacturing Methods F | 4.5
- MECH 230 Thermodynamics I F | 3.5
- MECH 215 -NOT OFFERED IN 2017-2018 - Instrumentation and Measurement F | 3.5
- MECH 270 Materials Science and Engineering F | 3.75
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MTHE 272 Application of Numerical Methods W | 3.5
- MECH 216 NOT OFFERED IN 2017-2018 - Instrumentation and Measurement Labs F | K2
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Minimum Total Credits: 44.5

Note: Students should be aware that a transfer or a change in option choice may result in their program requirements taking more than the typical 4 years because of course availability and conflicts in their core timetable. The department cannot possibly guarantee that courses will not conflict when a student changes options or transfers, especially after 2nd year.

MME students normally take APSC 200/298 in in the winter term.

Third Year CORE 2017-2018

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- ELEC 310 Introductory Analog Electronic and Digital Circuits F | 4.5
- MECH 323 Machine Design W | 4.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5
- MTHE 367 Engineering Data Analysis W | 3.5

General Sub-Plan (ME1)

Note: MECH 396 and MECH 397 require MECH 370 and MECH 371 as co-requisites which would be additional courses in the third year for students in the ME1 or ME3 options.

- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
OR
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2
OR
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Materials Sub-Plan (ME2)

- MECH 370 Principles of Materials Processing F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Biomechanical Sub-Plan (ME3)

- CHEE 340 Biomedical Engineering W | 3.5

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
OR
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 393 Biomechanical Product Development F | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2
OR
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Fourth Year CORE 2018-2019

- Complementary Studies, List A, F, or W | 6
- Complementary Studies, List A, B, C, or D, F or W | 3
- ME1 and ME2 Technical Electives (See Technical Elective List) F and W | 23.5
- ME3 Technical Electives (See Technical Elective List) F and W | 20

Important to Note: Students must have a minimum total of 23.5 credits of Technical Electives in the ME1 and ME2 options, and a minimum total of 20 credits of Technical Electives in the ME3 option. This count includes any non-core technical electives or free electives taken in a student's 2nd, 3rd and 4th years from the specific lists required for their option which are outlined in the Technical Elective description.

General Sub-Plan (ME1)

- MECH 460 Team Project - Conceive and Design F | K4
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

Materials Sub-Plan (ME2)

- MECH 460 Team Project - Conceive and Design F | K4 *
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

Biomechanical Sub-Plan (ME3)

- MECH 460 Team Project - Conceive and Design F | K4
AND
- MECH 462 Team Project - Implement and Operate W | K3.5
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

* Capstone Design Course

All students must take a final year capstone design course in their program. For the ME1 and ME2 option students this course would normally be MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall). ME3 students will normally take MECH 460 (4 credits, Fall) and MECH 464 (1.5 credits, Fall) and MECH 462 (3.5 credits in Winter).

However, students in the ME1 and ME2 options may choose to take APSC 480 , Multi-disciplinary Industry Engineering Design Project (9 credits FW) as a substitute for MECH 460 and MECH 464 , and if the case will receive 3.5 credits of List 1 technical electives that will count towards their required minimum option technical elective credit count.

ME3 students may choose to take APSC 480 (9 credits, FW) as a substitute for MECH 460, MECH 464, and MECH 462

Note that APSC 480 has a prerequisite of APSC 381 and this is taken in the winter term of third year.

Important Note: All students, regardless of their option who want to take APSC 480 must make sure they DROP MECH 460 , MECH 464 , (and MECH 462 if ME3) from their pre-loaded courses on SOLUS, and ADD APSC 480 . All students are limited to taking only ONE final year capstone project course, MECH 460 or APSC 480 .

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Mechanical Program, the Engineering Economics core course is APSC 221 , and the Communications core courses are APSC 293 and MECH 464 (or APSC 480).

Technical Electives

Mechanical and Materials Engineering: Technical Electives

Mechanical and Materials Engineering, B.A.Sc. (Class of 2020)

Second Year Common Core - 2017/18

- MECH 217 Measurement in Mechatronics F | 4.25
- MECH 221 Solid Mechanics I F/S-OL | 4
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- MECH 213 Manufacturing Methods F | 4.5
- MECH 230 Thermodynamics I F | 3.5
- MECH 270 Materials Science and Engineering F | 3.75
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MTHE 272 Application of Numerical Methods W | 3.5
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W/S-OL | 3.5

Minimum Total Credits: 43.25

Note: Students should be aware that a transfer or a change in option choice may result in their program requirements taking more than the typical 4 years because of course availability and conflicts in their core timetable. The department cannot guarantee that courses will not conflict when a student changes options or transfers, especially after 2nd year.

MME students normally take APSC 200/293 in the winter term.

Third Year Common Core - 2018/19

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MECH 321 Solid Mechanics II F | 3.5
- MECH 328 Dynamics and Vibration F | 3.5
- ELEC 310 Introductory Analog Electronic and Digital Circuits F | 4.5
- MECH 323 Machine Design W | 4.5
- MECH 346 Heat Transfer W | 3.5
- MECH 350 Automatic Control W | 3.5
- MTHE 367 Engineering Data Analysis W | 3.5

General Sub-Plan (ME1)

Note: MECH 396 and MECH 397 require MECH 370 and MECH 371 as co-requisites which would be additional courses in the third year for students in the ME1 or ME3 options.

- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
OR
- MECH 398 Mechanical Engineering Laboratory I F | K3
- MECH 341 Fluid Mechanics II W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2
OR
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Materials Sub-Plan (ME2)

- MECH 370 Principles of Materials Processing F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
- MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Biomechanical Sub-Plan (ME3)

- MECH 393 Biomechanical Product Development F | 3.5

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K3
OR
- MECH 398 Mechanical Engineering Laboratory I F | K3
- CHEE 340 Biomedical Engineering W | 3.5
- MECH 397 Mechanical and Materials Engineering Laboratory II W | K2
OR
- MECH 399 Mechanical Engineering Laboratory II W | K2

Minimum Total Credits: 41.5

Fourth Year Common Core - 2019/2020

- Complementary Studies, List A, F or W | 6
- Complementary Studies, List A, B, C, or D, F or W | 3
- ME1 and ME2 Technical Electives (See Technical Elective List) F and W | 23.5
- ME3 Technical Electives (See Technical Elective List) F and W | 20

Important to Note: Students must have a minimum total of 23.5 credits of Technical Electives in the ME1 and ME2 options, and a minimum total of 20 credits of Technical Electives in the ME3 option. This count includes any non-core technical electives or free electives taken in a student's 2nd, 3rd and 4th years from the specific lists required for their option which are outlined in the Technical Elective description.

General Sub-Plan (ME1) Core

- MECH 460 Team Project - Conceive and Design F | K4 *
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

Materials Sub-Plan (ME2) Core

- MECH 460 Team Project - Conceive and Design F | K4 *
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

Biomechanical Sub-Plan (ME3) Core

- MECH 460 Team Project - Conceive and Design F | K4 *
AND
- MECH 462 Team Project - Implement and Operate W | K3.5
- MECH 464 Communications and Project Management F | 1.5

Minimum Total Credits: 38

* Capstone Design Course

All students must take a final year capstone design course in their program. For the ME1 and ME2 option students this course would normally be MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall). ME3 students will normally take MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall), in addition to MECH 462 (3.5 credits, Winter).

However, students in the ME1 and ME2 options may choose to take APSC 480 (9 credits, Fall and Winter), Multi-disciplinary Industry Engineering Design Project as a substitute for MECH 460 and MECH 464, and if the case will receive 3.5 credits of List 1 technical electives that will count towards their required minimum technical elective credit count.

ME3 students may choose to take APSC 480 (9 credits, FW) as a substitute for MECH 460, MECH 464, and MECH 462.

Note that APSC 480 has a prerequisite of APSC 381, normally taken in the winter term of third year.

Important Note: All students who want to take APSC 480 must make sure they **DROP** MECH 460, MECH 464, and MECH 462 from their preloaded courses on SOLUS, and **ADD** APSC 480. All students are limited to taking only **ONE** final year capstone project course, either MECH 460 or APSC 480.

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering plans. For the Mechanical Program, the Engineering Economics core course is APSC 221, and the Communications core courses are APSC 293 and MECH 464.

Technical Electives

Mechanical and Materials Engineering: Technical Electives

Mining Engineering

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The mineral industry deals with the excavation and processing of ore to obtain the mineral products required by contemporary society. To meet industrial requirements, the curriculum of Mining Engineering provides three closely associated options: Mining Engineering, Mineral Processing and Environmental Engineering and Mine-Mechanical Engineering. The Mining Engineering Option, in addition to the fundamentals of mining, includes elements of earthworks and excavation for both surface and underground. In the Mineral Processing and Environmental Engineering option, the subjects addressed include the design, operation and control of ore treatment plants and the environmental control systems required by government regulations. The Mine-Mechanical option produces mining engineers who understand the design, modification, automation, use and maintenance of heavy and specialized equipment in the mining industry.

Options available:

- Mining Option
- Mineral Processing Option
- Mechanical Option

Mining Engineering, B.A.Sc. (Class of 2021)

Second Year Common Core - 2015/2016

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CIVL 230 Solid Mechanics I F | 4.25
- MINE 201 Introduction to Mining and Mineral Processing F | 4
- MINE 202 Computer Applications and Instrumentation in Mining F | 1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MINE 244 Underground Mining W | 3
- MTHE 272 Application of Numerical Methods W | 3.5

Subtotal Credits: 32

Mining Option N1

- MECH 230 Thermodynamics I F | 3.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1
- MTHE 367 Engineering Data Analysis W | 3.5

Subtotal Credits: 11.5

Minimum Total Credits: 43.5

Minerals Processing Environmental Option N2

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1

Subtotal Credits: 11.5

Minimum Total Credits: 43.5

Mine-Mechanical Option N3

- MECH 230 Thermodynamics I F | 3.5

- MECH 228 Kinematics and Dynamics W | 3.5
- MTHE 367 Engineering Data Analysis W | 3.5

Subtotal Credits: 10.5

Minimum Total Credits: 42.5

Third Year Common Core - 2016/2017

- MINE 321 Drilling and Blasting F | 4.5
- MINE 331 Methods of Mineral Separation F | 4.5
- MINE 341 Open Pit Mining F | 4.5
- GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
- MINE 324 Hydraulics for Mining Applications W | 3.5
- MINE 325 Applied Rock Mechanics W | 4.5
- MINE 326 Operations Research W | 4.5

Subtotal Credits: 29.75

Mining Option N1

- MINE 339 Mine Ventilation F | 4.5
- Complementary Studies, List A F | 3
- Elective F | 3
- MINE 330 Mineral Industry Economics W | 3.5
- Elective W | 3

Subtotal Credits: 17

Minimum Total Credits: 46.75

Minerals Processing Environmental Option N2

- CHEE 321 Chemical Reaction Engineering F | 3.5
- Complementary Studies, List A F | 3
- Elective F | 3
- CHEE 319 Process Dynamics and Control W | 3.5
- MINE 330 Mineral Industry Economics W | 3.5

Subtotal Credits: 16.5

Minimum Total Credits: 46.25

Mine-Mechanical Option N3

- MECH 270 Materials Science and Engineering F | 3.75

- MECH 328 Dynamics and Vibration F | 3.5
- Complementary Studies, List A F | 3
- MECH 323 Machine Design W | 4.5
- MECH 350 Automatic Control W | 3.5

Subtotal Credits: 18.25

Minimum Total Credits: 48

Fourth Year Common Core - 2017/2018

- MINE 422 Mining and Sustainability F | 4
- MINE 459 Reliability, Maintenance, and Risk Assessment F | 4
- MINE 462 Occupational Health and Safety in Mining Practice F | 3.5
- MINE 434 Project Report F/W | 4

Subtotal Credits: 15.5

Mining Option N1

- MINE 467 Geostatistics and Orebody Modelling F | 4.5
- MINE 469 Stability Analysis in Mine Design F | 4
- MINE 445 Open Pit Mine Design W | 5.5
- MINE 448 Underground Design W | 5.5
- Complementary Studies, List A W | 3
- Elective W | 3

Subtotal Credits: 25.5

Minimum Total Credits: 41

Minerals Processing Environmental Option N2

- MINE 451 Chemical Extraction of Metals F | 3
- MINE 455 Design, Analysis and Operation of Mineral Processes F | 4.5
- MINE 458 Process Investigations W | 4
- Complementary Studies, List A W | 3
- Elective W | 3
- Elective W | 3

Subtotal Credits: 20.5

Minimum Total Credits: 36

Mine-Mechanical Option N3

- MINE 339 Mine Ventilation F | 4.5
- Complementary Studies, List A F | 3
- MINE 330 Mineral Industry Economics W | 3.5
- MINE 471 Mine-Mechanical Design Project W | 5.5
- Elective W | 3
- Elective W | 3

Subtotal Credits: 22.5

Minimum Total Credits: 38

Elective requirements

- Students in the N1-Mine-Mine option must take a minimum of three courses from the approved Elective list.
- Students in the N2-Mineral Processing Environmental option must take a minimum of three courses from the approved Elective list.
- Students in the N3-Mine-Mechanical option must take a minimum of two courses from the approved Elective list.

Mining Engineering: Electives

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Mining Program, the Engineering Economics courses are APSC 221 and MINE 330. The Communications courses are APSC 293 and MINE 434. Included in the core program is an additional 3.5 credits of Linkage in MINE 462.

Mining Engineering, B.A.Sc. (Class of 2019)

Second Year Common Core - 2016/2017

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CIVL 230 Solid Mechanics I F | 4.25
- MINE 201 Introduction to Mining and Mineral Processing F | 4
- MINE 202 Computer Applications and Instrumentation in Mining F | 1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MINE 244 Underground Mining W | 3
- MTHE 272 Application of Numerical Methods W | 3.5

Subtotal Credits: 32

Mining Option N1

- MECH 230 Thermodynamics I F | 3.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1
- MTHE 367 Engineering Data Analysis W | 3.5

Subtotal Credit: 11.5

Minimum Total Credits: 44

Minerals Processing Environmental Option N2

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1

Subtotal Credits: 11.5

Minimum Total Credits: 43.5

Mine-Mechanical Option N3

- MECH 230 Thermodynamics I F | 3.5
- MECH 228 Kinematics and Dynamics W | 3.5
- MTHE 367 Engineering Data Analysis W | 3.5

Subtotal Credits: 10.5

Minimum Total Credits: 42.5

Third Year Common Core - 2017/2018

- MINE 321 Drilling and Blasting F | 4.5
- MINE 331 Methods of Mineral Separation F | 4.5
- MINE 341 Open Pit Mining F | 4.5
- GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
- MINE 324 Hydraulics for Mining Applications W | 3.5
- MINE 325 Applied Rock Mechanics W | 4.5
- MINE 326 Operations Research W | 4.5

Subtotal Credits: 29.75

Mining Option N1

- MINE 339 Mine Ventilation F | 4.5
- Complementary Studies, List A F | 3

- Elective F | 3
- MINE 330 Mineral Industry Economics W | 3.5
- Elective W | 3

Subtotal Credits: 17

Minimum Total Credits: 46.75

Minerals Processing Environmental Option N2

- CHEE 321 Chemical Reaction Engineering F | 3.5
- Complementary Studies, List A F | 3
- Elective F | 3
- CHEE 319 Process Dynamics and Control W | 3.5
- MINE 330 Mineral Industry Economics W | 3.5

Subtotal Credits: 16.5

Minimum Total Credits: 46.25

Mine-Mechanical Option N3

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 328 Dynamics and Vibration F | 3.5
- Complementary Studies, List A F | 3
- MECH 323 Machine Design W | 4.5
- MECH 350 Automatic Control W | 3.5

Subtotal Credit: 18.25

Minimum Total Credits: 48

Fourth Year Common Core - 2018/2019

- MINE 422 Mining and Sustainability F | 4
- MINE 459 Reliability, Maintenance, and Risk Assessment F | 4
- MINE 462 Occupational Health and Safety in Mining Practice F | 3.5
- MINE 434 Project Report F/W | 4

Subtotal Credit: 15.5

Mining Option N1

- MINE 467 Geostatistics and Orebody Modelling F | 4.5
- MINE 469 Stability Analysis in Mine Design F | 4
- MINE 445 Open Pit Mine Design W | 5.5

- MINE 448 Underground Design W | 5.5
- Complementary Studies, List A W | 3
- Elective W | 3

Subtotal Credits: 25.5

Minimum Total Credits: 41

Minerals Processing Environmental Option N2

- MINE 451 Chemical Extraction of Metals F | 3
- MINE 455 Design, Analysis and Operation of Mineral Processes F | 4.5
- MINE 458 Process Investigations W | 4
- Complementary Studies, List A W | 3
- Elective W | 3
- Elective W | 3

Subtotal Credits: 20.5

Minimum Total Credits: 36

Mine-Mechanical Option N3

- MINE 339 Mine Ventilation F | 4.5
- Complementary Studies, List A F | 3
- MINE 330 Mineral Industry Economics W | 3.5
- MINE 471 Mine-Mechanical Design Project W | 5.5
- Elective W | 3
- Elective W | 3

Subtotal Credits: 22.5

Minimum Total Credits: 38

Elective Requirements

- Students in the N1 – Mine-Mine option must take a minimum of three courses from the approved Elective list.
- Students in the N2 – Mineral Processing Environmental option must take a minimum of three courses from the approved Elective list.
- Students in the N3 – Mine-Mechanical option must take a minimum of two courses from the approved Elective list.

Elective List

- Some of the courses listed in this table also appear on Complimentary Studies List "A". Please note that a course can only count as either an Elective or a List A (not as both).

- Please note that it is the student's responsibility to check SOLUS to determine if a course is being offered during a particular year and if it is, in which term it is being held. Course availability and the term in which it is held can change on a yearly basis.

Mining Engineering: Electives

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Mining Program, the Engineering Economics courses are APSC 221 and MINE 330. The Communications courses are APSC 293 and MINE 434. Included in the core program is an additional 3.5 credits of Linkage in MINE 462.

Mining Engineering, B.A.Sc. (Class of 2020)

Second Year Common Core - 2017/2018

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CIVL 230 Solid Mechanics I F | 4.25
- MINE 201 Introduction to Mining and Mineral Processing F | 4
- MINE 202 Computer Applications and Instrumentation in Mining F | 1.5
- MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25
- MINE 244 Underground Mining W | 3
- MTHE 272 Application of Numerical Methods W | 3.5

Subtotal Credits: 32

Mining Option N1

- MECH 230 Thermodynamics I F | 3.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1
- MTHE 367 Engineering Data Analysis W | 3.5

Subtotal Credits: 11.5

Minimum Total Credits: 43.5

Minerals Processing Environmental Option N2

- CHEE 209 Analysis of Process Data F | 3.5
- CHEE 210 Thermodynamic Properties of Fluids W | 3.5
- MINE 267 Applied Chemistry for Mining W | 3.5
- MINE 268 Analytical Methods in Mining W | 1

Subtotal Credits: 11.5

Minimum Total Credits: 43.5

Mine-Mechanical Option N3

- MECH 230 Thermodynamics I F | 3.5
- MECH 228 Kinematics and Dynamics W | 3.5
- MTHE 367 Engineering Data Analysis W | 3.5

Subtotal Credits: 10.5

Minimum Total Credits: 42.5

Third Year Common Core - 2018/2019

- MINE 321 Drilling and Blasting F | 4.5
- MINE 331 Methods of Mineral Separation F | 4.5
- MINE 341 Open Pit Mining F | 4.5
- GEOE 262 Geological Aspects of Mineral Deposits W | 3.75
- MINE 324 Hydraulics for Mining Applications W | 3.5
- MINE 325 Applied Rock Mechanics W | 4.5
- MINE 326 Operations Research W | 4.5

Subtotal Credits: 29.75

Mining Option N1

- MINE 339 Mine Ventilation F | 4.5
- Complementary Studies, List A F | 3
- Elective F | 3
- MINE 330 Mineral Industry Economics W | 3.5
- Elective W | 3

Subtotal Credits: 17

Minimum Total Credits: 46.75

Minerals Processing Environmental Option N2

- CHEE 321 Chemical Reaction Engineering F | 3.5
- Complementary Studies, List A F | 3
- Elective F | 3
- CHEE 319 Process Dynamics and Control W | 3.5
- MINE 330 Mineral Industry Economics W | 3.5

Subtotal Credits: 16.5

Minimum Total Credits: 46.25

Mine-Mechanical Option N3

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 328 Dynamics and Vibration F | 3.5
- Complementary Studies, List A F | 3
- MECH 323 Machine Design W | 4.5
- MECH 350 Automatic Control W | 3.5

Subtotal Credits: 18.25

Minimum Total Credits: 48

Fourth Year Common Core - 2019/2020

- MINE 422 Mining and Sustainability F | 4
- MINE 462 Occupational Health and Safety in Mining Practice F | 3.5
- MINE 459 Reliability, Maintenance, and Risk Assessment F | 4
- MINE 434 Project Report F/W | 4

Subtotal Credits: 15.5

Mining Option N1

- MINE 467 Geostatistics and Orebody Modelling F | 4.5
- MINE 469 Stability Analysis in Mine Design F | 4
- MINE 445 Open Pit Mine Design W | 5.5
- MINE 448 Underground Design W | 5.5
- Complementary Studies, List A W | 3
- Elective W | 3

Subtotal Credits: 25.5

Minimum Total Credits: 41

Minerals Processing Environmental Option N2

- MINE 451 Chemical Extraction of Metals F | 3
- MINE 455 Design, Analysis and Operation of Mineral Processes F | 4.5
- MINE 458 Process Investigations W | 4
- Complementary Studies, List A W | 3
- Elective W | 3
- Elective W | 3

Subtotal Credits: 20.5

Minimum Total Credits: 36

Mine-Mechanical Option N3

- MINE 339 Mine Ventilation F | 4.5
- Complementary Studies, List A F | 3
- MINE 330 Mineral Industry Economics W | 3.5
- MINE 471 Mine-Mechanical Design Project W | 5.5
- Elective W | 3
- Elective W | 3

Subtotal Credits: 22.5

Minimum Total Credits: 38

Elective requirements

- Students in the N1 – Mine-Mine option must take a minimum of three courses from the approved Elective list.
- Students in the N2 – Mineral Processing Environmental option must take a minimum of three courses from the approved Elective list.
- Students in the N3 – Mine-Mechanical option must take a minimum of two courses from the approved Elective list.

Elective List

- Some of the courses listed in this table also appear on Complimentary Studies List "A". Please note that a course can only count as either an Elective or a List A (not as both).
- Please note that it is the student's responsibility to check SOLUS to determine if a course is being offered during a particular year and if it is, in which term it is being held. Course availability and the term in which it is held can change on a yearly basis.

Mining Engineering: Electives

Complementary Studies

Refer to the Complementary Studies section of this calendar for details regarding the requirements for all Engineering programs. For the Mining Program, the Engineering Economics courses are APSC 221 and MINE 330. The Communications courses are APSC 293 and MINE 434. Included in the core program is an additional 3.5 credits of Linkage in MINE 462.

Mining Engineering Technology, BTech

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The modern mining industry is concerned with the stewardship and recovery of the earth's mineral resources in an economic and sustainable manner, while also adhering to ethical and social values. Mining professionals have to be technically proficient, work safely, have business and management skills, recognize and mitigate negative environmental effects, understand the interests of local communities, and design for sustainability. The Bachelor of Mining Engineering Technology curriculum has been designed to provide technical, managerial, and sustainability skills, as well as develop an understanding of the business of mining in terms of economics, finance, and people. Recognizing that technical competence is key to the business of mining, these competencies will be emphasized by providing the necessary fundamental background in science and mathematics, and reinforced through a two-week hands-on field school placement, occurring in the summer of each year (one in Kingston, the other in Timmins), which will also serve to enhance the development of applied skills and theoretical concepts. Ultimately, the curriculum is designed to produce experienced mining professionals with technical hands-on communication and business skills, sensitive to the values of society, and with an ability to adapt to the future needs of the industry.

Progression:

- *All curriculum may be completed at either a full-time or part-time pace.*
- *Courses are group-paced, delivered asynchronously, and are 12 weeks in length.*
- *Upon enrolment, students must complete a customized bridge curriculum (offered via distance delivery), before progressing into Year 3 of the program.*
- *Years 3 and 4 will each contain 12 courses (also offered via distance delivery - pending curriculum committee approval).*
- *Upon completion of each year's curriculum, students will then be required to complete a two-week, laboratory intensive field placement, consisting of a series of labs based on the year's curriculum.*

Mining Engineering Technology, BTech

Bridge Curriculum Common CORE

¹ Mining Engineering Technician stream students take this in their 3rd year program.

- MNTC P01 Engineering Mathematics F/OL | 3 ¹
- MNTC P06 Foundational Chemistry F/OL | 3

Bridge Curriculum Engineering Technologist Stream

- MNTC P02 Mining Geology W/OL | 3
- MNTC P07 Surveying Principles W/OL | 3

Bridge Curriculum Mining Engineering Technician Stream

- MNTC P03 Foundational Mathematics W/OL | 3
- MNTC P04 Calculus S/OL | 3
- MNTC P05 Foundational Physics W/OL | 3

Year 3

Engineering Technologist Stream

- MNTC 301 Technical Writing and Communication F/OL | 3
- MNTC 302 Engineering Physics F/OL | 3
- MNTC 303 Engineering Chemistry F/OL | 3
- MNTC 304 Applied Metrology and Data Analysis W/OL | 3
- MNTC 305 Introduction to Mining F/OL | 3
- MNTC 306 Mineral Processing Unit Operations W/OL | 3
- MNTC 307 Geomechanics and Ground Control W/OL | 3
- MNTC 308 Mine Health and Safety W/OL | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MNTC 310 Mining and Society S/OL | 3
- MNTC 313 Introduction to Computer Programming for Engineering Applications W/OL | 3
- MNTC 314 Drilling and Blasting W/OL | 3
- MNTC 399 Field School I (Kingston) S | 5

Mining Engineering Technician Stream

- MNTC 301 Technical Writing and Communication F/OL | 3
- MNTC 302 Engineering Physics F/OL | 3
- MNTC 303 Engineering Chemistry F/OL | 3
- MNTC 304 Applied Metrology and Data Analysis W/OL | 3
- MNTC 307 Geomechanics and Ground Control W/OL | 3
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- MNTC 310 Mining and Society S/OL | 3
- MNTC 313 Introduction to Computer Programming for Engineering Applications W/OL | 3
- MNTC 314 Drilling and Blasting W/OL | 3
- MNTC 399 Field School I (Kingston) S | 5

Year 4

Common CORE for All Streams

- MNTC 413 Surface Mine Design S/OL | 3
- MNTC 414 Underground Mine Planning F/OL | 3
- MNTC 415 Metal Extraction Processes F/OL | 3
- MNTC 416 Ventilation and Hydraulics F/OL | 3
- MNTC 418 Sustainability and the Environment S/OL | 3
- MNTC 419 Mine Supervision and Project Management W/OL | 3
- MNTC 420 Physical Asset Management for Mining Equipment W/OL | 3
- MNTC 421 Leadership Management S/OL | 3
- MNTC 423 Geomatics S/OL | 3
- MNTC 425 Ore Body Modelling and Resource Estimation S/OL | 3
- MNTC 426 Business Law and Ethics S/OL | 3

- MNTC 498 Capstone Project S/OL | 3
- MNTC 499 Field School II (Timmins) S | 5

Complementary Studies

Complementary Studies complement the technical content of a student's curriculum, and are sub-divided into **six areas of study**:

- Engineering Economics (EEC);
- Communications (CMC);
- List A Courses: Humanities and Social Sciences (H&SS);
- List B Courses: Linkage and Professional Issues (LNK);
- List C Courses: Performance Arts and Languages (PAL); and
- List D Courses: Management, Business, and Law (MBL).

In all academic plans in the Faculty students must complete courses in Complementary Studies amounting to at least 18.75 credits. All of the academic plans in the Faculty have courses in Complementary Studies built into the CORE of the curriculum, and/or have portions of technical courses assigned to topics in Complementary Studies. The exact requirements vary from plan to plan, the details are provided in the curriculum for each Academic Plan.

Students **MUST** complete a minimum number of credits in some of the above six areas of study. Some of these credits are obtained in faculty-wide core courses while others may be drawn from a list of elective courses. The table below shows the credits in the core courses and lists of elective courses from which additional required credits must be drawn. The lists are updated each year, and a course qualifies as a Complementary Studies course only if it appears on the list for the Academic Session in which the course is taken.

Area of Study	Core Courses	Credits in core courses	List of additional courses	Total required credits
Engineering Economics	APSC 221, APSC 321 OR CHEE 310 ¹	3		3
Communications	APSC 100, APSC 293	2	See note 2 below	3
Humanities and Social Science (H&SS)		0	List A	6
Linkage and Professional Issues (LNK)	APSC 100, APSC 151, APSC 200 ³	3	List B	3.5
Any combination of H&SS, LNK, PAL, or MGT			List A, B, C, or D	3
TOTAL				18.5

¹Note: At the end of each Academic Plan listing in the Calendar there is an explanation of which courses may be taken to meet the requirement for engineering economics.

²Note: At the end of each Academic Plan listing in the Calendar there is an explanation of which additional courses must be taken to meet the total credit requirement for Communications.

³Note: for the graduating class of 2014 and later, an additional 1 credit of Linkage and Professional issues will be delivered in third and fourth year courses in the Engineering Design and Practice Sequence, satisfying the requirement for 3.5 credit total. In special cases APSC 191 can be used to satisfy the required 3.5 credit of linkage by permission. For the graduating classes of 2013 and earlier, the required 3.5 credit was met by APSC 190 (no longer offered) or APSC 191.

Note that the credits in the table above add up to 18.5 credits, so an additional .25 credit of complementary studies are needed to reach the requirement of 18.75 credits. In many academic plans this additional .25 credit is provided by other upper year engineering courses, but it is the student's responsibility to check.

Engineering Economics Courses:

Engineering Economics courses introduce students to the economic analysis of engineering projects. Each student must take a minimum of 3 credits in Engineering Economics. At the end of each Degree Program listing in the Calendar there is an explanation of how students in that Program meet this requirement.

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5

Communications Courses:

The ability to communicate effectively, both orally and in writing is critical for all engineers. This is developed within each Department's curriculum in a variety of ways, including the evaluation of written reports and oral presentations. There are also courses designed specifically to improve a student's ability to communicate in English; these are listed below. In some programs one or more of these courses may be included in the core of the program.

Each student must take a minimum of 3 CR in Communications. At the end of each Academic Program listing in the Calendar there is an explanation of how students in that Program meet this requirement.

- APSC 293 Engineering Communications I F/W | K1
- CHEE 361 Engineering Communications, Ethics & Professionalism W | K1
- CIVL 200 Professional Skills I F | K 2.5
- CIVL 300 Professional Skills II F | K 2.5
- CIVL 400 Professional Skills III F | 2.5
- MECH 464 Communications and Project Management F | 1.5
- MINE 434 Project Report F/W | 4
- MTHE 494 Mathematics and Engineering Seminar F | 3
- ENPH 455 Engineering Physics Thesis FW | 4

List A – Humanities and Social Sciences:

Students must take a minimum of 6 credits in Humanities and Social Sciences from List A, and an additional 3 credits from List A, B, C or D.

Courses in LIST A introduce students to subject matter that deals with central issues, methodologies, and thought processes of the humanities and social sciences.

NOTE: A course will be accepted as a Humanities and Social Sciences (H&SS) credit only if it appears on the list of approved H&SS courses for the Academic Session in which the course is taken.

The following are the courses approved as H&SS credits for the Academic Session 2017-2018:

Art (ARTH only **except** ARTH 245, 404, 460)

Biomedical and Molecular Sciences (BMED 271 only)

Classics (all CLST; GREK 208, 321, 322, 421, 422, and 430; LATN 209, 310, 321, 322, 327, 421 and 422)

Commerce (COMM 251 and 651)

Development Studies (all DEVS)

Drama (DRAM 100, 201, 200, 202, 205, 210, 211, 220, 251, 289, 300, 301, 303, 306, 310, 311, 371, 375, 381, 401, 405, and 476)

Economics (all ECON **except** ECON 250, 255, 322, 437, 445, 450, and 455; PPEC 200, 400)

English language and literature (ENGL only)

Entrepreneurship and Innovation (ENIN 140, 240, 301, and 340)

Environmental Studies (ENSC 290, 305, 310, 315, 321, 420, and 490)

Film Studies (FILM 104, 106, 110, 140, 206, 216, 226, 236, 240, 260 (formerly 315), 300, 301, 302, 303, 305, 306, 307, 315 (renamed 260), 320, 322, 323, 331, 335, 336, 337, 338, 340, 345, 353, 368, 385, 415, 422, 425, 430, 435, 440, and 445)

French (FREN, 227, 241, 285, 290, 304, 305, 306, 315, 323, 324, 325, 327, 335, 342, 343, 351, 363, 387/487, 388, 390/490, 391, 394, 395, 396, 406, 424, and 477) (FRST 290, 294)

Geography (GPHY 227, 228, 229, 250, 254, 257, 258, 259, 325, 327, 332, 336, 337, 338, 339, 351, 352, 359, 362, 365, and 368, 370)

Gender Studies (all GNDS)

German Language and Literature (GRMN 308, 309, 311, 312, 317, 419, 420, 426, 427, 429, and 433)

Hebrew (HEBR 191, 292 and 393)

History (all HIST **except** HIST 257)

Health (HLTH 430)

Interdisciplinary Studies (IDIS 302-305)

International Studies (all INTS)

Jewish Studies (all JWST)

Languages, Literatures & Cultures (LLCU 110, 200, 201, 205, 207, 209, 210, 213, 214, 215, 226, 232, 233, 234, 244, 247, 248, 257, 301, 302, 303, 308, 309, 316, 319, 320, 322, 326, 327, 328, 329, 330, 331, 332, 333, 339, 340, 495)

Law (LAW 201 only)

Linguistics (LING 202, 205, 350, and 475)

Multi-Disciplinary (MDEP 221)

Music (MUSC 102, 114, 171, 203, 204, 205, 286, 289, 328, 329, 333, 334, 335, 338, 380, 381, 388, 393, 438, 445, 446, 470, 473, 474, 475, 476, 477, 480, 481, 485, 486, 490, 491, 592)

Music Theatre (MUTH 110, 111, 160, 201, 211, 231, 232, 240, and 329)

Philosophy (all PHIL)

Physical and Health Education (HLTH 101, 237, 239, 333, 334, and 405)

Political Studies (all POLS **except** POLS 385)

Psychology (PSYC 100, 101, 102, 103, 215, 221, 231, 235, 241, 251, 305, 321, 333, 335, 342, 348, 350, 355, 360, 380, 397, 400, 420, 423, 430, 433, 434, 435, 436, 437, 440, 441, 442, 443, 446, 450, 452, 453, 455, and 456)

Religious Studies (all RELS)

Sociology (SOCY 122, 200, 210, 211, 225, 226, 227, 235, 273, 275, 276, 300, 301, 303, 305, 306, 309, 310, 321, 336, 344, 352, 354, 362, 384, 387, 388, 389, 401, 402, 403, 404, 422, 424, 430, 431, 454, 457, 458, 472, and 476)

Spanish and Italian (SPAN 306, 310, 330, 331, 332, 344, 351, 352, 354, 380, 381, 406, 428, 458, 495, and 496; ITLN 310, 331, 332, 357, 408, 415, and 432)

Stage and Screen (STSC 300, 309, and 339)

List B Linkage and Professional Issues

The courses in LIST B are designed to expose students to two inter-related areas: 1) Linkage (the impact of technology on society) and 2) Professional Issues (the role and responsibility of the professional engineer in society).

For students first registering in first year engineering in September 2010 and later:

Linkage and Professional issues content will be included as part of the Engineering Design and practice sequence courses included in each year of the program.

For all other students:

Students require a minimum of 3.5 credits in Linkage and Professional Issues. Upper year and transfer students who will not be taking courses in the Engineering Design and Practice Sequence will meet the minimum requirement of 3.5 credits in Linkage and Professional issues by taking having either APSC 190 (no longer offered). APSC 191 can be used to satisfy the required 3.5 credits of linkage by permission.

For all students:

Once these Linkage and Professional Issues requirements have been fulfilled all students may take other courses from List B below to help complete their Complementary Studies requirements. Note that these courses cannot be used to fulfill any part of the minimum Linkage and Professional Issues requirement of 3.5 credits.

NOTE: A course will be accepted as a Linkage credit only if it appears on the list of approved Linkage courses for the Academic Session in which the course is taken. The following are the courses approved as PAL credits for the Academic Session 2013-2014.

- BIOL 111 Ecology and the Environment 3
- ENIN 205 Innovation for STEAM 3
- ENSC 103 Environment and Sustainability 3
- ENSC 200 Environmental History 3
- ENSC 201 Environmental Toxicology and Chemical Risks 3
- ENSC 203 Environment and Sustainability 3
- ENSC 301 Environmental Assessment 3
- ENSC 320 Wildlife Issues in a Change World 3
- ENSC 390 Sustainability 3
- ENSC 483 Special Topics in Environmental Studies II 3
- GPHY 101 Human Geography 3
- GPHY 210 Geographical Perspectives on Global Change 3
- GPHY 319 Bioenergy and Bio-refining in Canada 3
- HIST 257 Environmental History 3
- MECH 333 -NOT OFFERED THIS YEAR - Gender, Engineering and Technology W | 3
- MINE 462 Occupational Health and Safety in Mining Practice F | 3.5
- SOCY 284 Sociology of Information and Communication Technology 3
- SOCY 363 Science, Technology and Society 3
- COMM 409 Sustainability Measurement, Implementation and Evaluation 3

Students must take a minimum of 6 credits in Humanities and Social Sciences from List A, and an additional 3 credits from List A, B, C or D.

LIST C - Performance Arts and Languages

Courses in LIST C deal with performance in the various arts media (e.g. art, music, drama, film, creative writing) and in languages other than English.

NOTE: A course will be accepted as a Performance Arts and Language (PAL) credit only if it appears on the list of approved PAL courses for the Academic Session in which the course is taken.

The following are the courses approved as PAL credits for the Academic Session 2013-2014:

Arabic (ARAB 100, 200)

Art (ARTF only)

Art History (ARTH 485)

Chinese Language (CHIN 100, 200 and 300)

Classics (GREK 112; LATN 110)

Commerce (COMM 290)

Creative Writing (CWRI 293-296)

Drama (DRAM 181, 220, 236, 237, 238, 239, 241, 245, 246, 247, 271, 273, 314, 318, 323, 331, 332, 339, 342, 344, 345, 348, 350, 351, 371, 373, 400, 439, and 451; STSC 300 and 309)

Film Studies (FILM 250, 304, 312, 355, 360, 365, 375, 410, 450, and 451)

French Studies (FREN 011, 012, 016, 017, 100, 101, 102, 106, 107, 111, 112, 118, 150, 219, 230, 250, 283, 320, 330, 331, 353, 373, 393, 444, 450, 463, 473, and 493) and FRST 105 and 125

German Language and Literature (GRMN 101, 102, 201, 202, 203, 306, 307, 312)

Hebrew (HEBR 190, 294, 295, and 301)

Interdisciplinary Studies (IDIS 200, 201, and 311)

Japanese Language (JAPN 100, 200, 301, and 302)

Languages, Literatures and Cultures (LLCU 101, 102; LANG 101, 102, 201, 202, MOHK 101, 102; INUK 101)

Linguistics (LING 100, 310, 320, 330, 340, 415, 435, and 475)

Multi-Disciplinary (MDEP 400)

Music (MUSC 100, 104, 112, 115, 120, 121, 124, 125, 127, 129, 151, 152, 156, 180, 181, 183, 185, 187, 188, 189, 191, 200, 212, 215, 220, 221, 224, 225, 227, 229, 245, 253, 255, 270, 274, 280, 281, 283, 285, 292, 293, 300, 312, 315, 320, 321, 324, 325, 326, 351, 352, 354, 355, 358, 392, 394, 396, 398, 399, 400, 412, 415, 420, 421, 424, 425, 443, 451, 452, 454, 455)

Music Theatre (MUTH 320, 380, and 387)

Portuguese (PORT 103 and PORT 104)

Spanish and Italian (SPAN 111, 112, 204, 205, 206, 301, 302, 303, 304, 401, 402 and 410; ITLN 111, 112, 204, 205)

List D – Management, Business, and Law Courses

Courses which relate to management issues can be found in the in the School of Urban and Regional Planning (SURP) and in the School of Business (COMM). Some programs require or permit students to take one or more of these Management courses from the lists below.

Management Courses Offered by the Faculty of Engineering and Applied Science

- APSC 223 Global Project Management S | K3

Management Courses Offered by the School of Urban and Regional Planning

- SURP 851 Environmental Policy W | 3
- SURP 853 Environmental Services W | 3

- SURP 855 Environmental Planning and Management W | 3

Management Courses Offered by the School of Business

- COMM 200 Introduction to Business 3
- COMM 201 Introduction to Business for Entrepreneurs
- COMM 211 Introduction to Financial Accounting 3
- COMM 212 Introduction to Management Accounting 3
- COMM 221 Introduction to Finance 3
- COMM 226 Comparative Financial Institutions 3
- COMM 231 Introduction to Marketing 3
- COMM 244 Project Management: An Engineering Economics Perspective 3
- COMM 251 Organizational Behaviour 3
- COMM 290 Empowering Business with Information Technology
- COMM 303 Business and Ethics 3
- COMM 305 Introduction to Entrepreneurship 3
- COMM 308 Canadian Business History 3
- COMM 310 Environmental Accounting 3
- COMM 311 Financial Accounting Practices, Principles and Concepts 3
- COMM 312 Intermediate Management Accounting 3
- COMM 313 Financial Accounting II 3
- COMM 322 Financial Management 3
- COMM 323 Corporate Financial Planning 3
- COMM 325 Financial Modelling 3
- COMM 326 The Economics of Canada's Financial System 3
- COMM 328 International Finance 3
- COMM 329 Management of Financial Institutions 3
- COMM 351 Leadership 3
- COMM 353 Managing in a Multicultural Environment 3
- COMM 357 Interpersonal Skills for Managers 3
- COMM 375 International Business 3
- COMM 381 Business Law I 3
- COMM 382 Business Law II 3
- COMM 387 The Behavioural Study of Unions 3
- COMM 408 Sustainability Strategies and Practices 3
- COMM 496 IS Security, Privacy and Ethics 3

Management Courses Offered by the Faculty of Arts and Science/ School of Industrial Relations

- DEVS 333 Business and Global Development
- EMPR 200 Work and Employment Relations in Canada
- EMPR 210 Employment Relations and Labour Law
- EMPR 220 Conflict Resolution
- EMPR 230 Managing Human Resources and Employment Relations
- EMPR 240 Labour Policy
- EMPR 250 Managing Workplace Health, Safety, and Wellness

- EMPR 320 Workplace Mediation and Alternative Dispute Resolution
- EMPR 330 Strategic HR Management: Building High Performance Workplaces
- EMPR 335 Managing Employee Attitudes for Organizational Success
- ENIN 200 Foundations of Entrepreneurship
- ENIN 204 Publicity and Media Relations
- ENIN 207 Envisioning Disruptive Technologies
- MUTH 340 Arts Professionalism

Law Courses Offered by the Faculty of Law

- LAW 201 Introduction to Canadian Law (Can be used as a List A OR a List D)
- LAW 202 Aboriginal Law
- LAW 203 Workplace Law
- LAW 204 Corporate Law

Courses of Instruction

APSC 100 Engineering Practice I FW | K9

APSC 101 Engineering Problem Solving and Modeling F | K2.9

APSC 102 Experimentation and Design F/W | K2.8

APSC 103 Engineering Design Project W | K3.3

APSC 111 Physics I F | 3.3

APSC 112 Physics II W | 3.3

APSC 131 Chemistry and Materials F | 3.3

APSC 132 Chemistry and its Applications W | 3.3

APSC 142 Introduction to Computer Programming for Engineers F/W | 3

APSC 143 Introduction to Computer Programming for Engineers F | 3.3

APSC 151 Engineering Geology and the Biosphere F | 3.3

APSC 161 Engineering Graphics W | 3.5

APSC 162 Engineering Graphics W | 2.5

APSC 171 Calculus I F | 3.3

APSC 172 Calculus II W | 3.3

APSC 174 Introduction to Linear Algebra W | 3.3

APSC 182 Applied Engineering Mechanics W | 1.7

APSC 191 Deleted - Professional Engineering Skills FW | 3.5

APSC 200 Engineering Design and Practice II F/W | K4

APSC 202 Engineering Design and Practice II: Client-Based Design W | K4

APSC 221 Economics and Business Practices in Engineering F/W/S | 3

APSC 223 Global Project Management S | K3

APSC 262 NOT OFFERED THIS YEAR: Engineering Surveying | 3.25

APSC 291 NOT OFFERED THIS YEAR: Engineering Communications I F | 1

APSC 292 Deleted - Engineering Communications II W | 1.25

APSC 293 Engineering Communications I F/W | K1

APSC 301 Professional Internship | 3.0

APSC 302 Professional Internship | 3.0

APSC 303 Professional Internship | 3.0

APSC 304 Professional Internship | 3.0

APSC 321 Deleted - Economic and Business Practices in Mining and Geological Engineering |

APSC 381 Advanced Design and Skills for Innovation W | K3.5

APSC 400 Deleted - Technology, Engineering and Management (TEAM) FW* | 6.5

APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9

BCHM 310 General Biochemistry FW | 9

BCHM 315 Proteins and Enzymes F | 3

BCHM 410 Protein Structure and Function F | 3

BIOL 102 Introductory Biology of Cells F | 3

BIOL 103 Introductory to Biology of Organisms W | 3

BIOL 205 Mendelian and Molecular Genetics F | 3

BIOL 335 Limnology and Aquatic Ecology F | 3

BIOM 300 Not Offered 2017-2018 - Modeling Techniques in Biology W | 3

CHEE 209 Analysis of Process Data F | 3.5

CHEE 210 Thermodynamic Properties of Fluids W | 3.5

CHEE 218 Laboratory Projects I W | 2.5

CHEE 221 Chemical Processes and Systems F | 3.5

CHEE 222 Process Dynamics and Numerical Methods W | 3.5

CHEE 223 Fluid Mechanics W | 3.5

CHEE 224 Transport Phenomena Fundamentals F | 3

CHEE 229 Cell Based Engineering Principles F | 4

CHEE 310 Engineering Innovation and Entrepreneurship F | 3.5

CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5

CHEE 315 Laboratory Projects II F/W | 4

CHEE 319 Process Dynamics and Control W | 3.5

CHEE 321 Chemical Reaction Engineering F | 3.5

CHEE 323 Industrial Catalysis W | 3.5

CHEE 324 Organic Process Development W | 3.5

CHEE 330 Heat and Mass Transfer F | 3.5

CHEE 331 Design of Unit Operations W | K 4.5

CHEE 332 Design of Unit Operations W | K 4.5

CHEE 333 Design of Unit Operations W | K 4.5

CHEE 340 Biomedical Engineering W | 3.5

CHEE 342 Environmental Biotechnology F | 3.5

CHEE 360 Deleted - Technical Communications W | 1.5

CHEE 361 Engineering Communications, Ethics & Professionalism W | K1

CHEE 370 Deleted - Waste Treatment Processes W | 3.5

CHEE 371 Mitigation of Industrial Pollution W | 3.5

CHEE 380 Biochemical Engineering F | 3.5

CHEE 400 Technology, Engineering & Management (TEAM) FW | K7

CHEE 405 Biochemical/Biomedical Research Project FW | 7

CHEE 406 Bioenvironmental Research Project FW | 7

CHEE 407 Deleted - Biochemical/Biomedical/Bioenvironmental Research Seminar W | 3

CHEE 408 Bioengineering Research Project FW | K7

CHEE 412 Transport Phenomena W | 3.5

CHEE 414 Foundations of the Oil and Gas Industry W | 3.5

CHEE 418 Strategies for Process Investigations F | 3.5

CHEE 420 Laboratory Projects III F/W | K 4

CHEE 421 Research Project FW | K 7

CHEE 434 NOT OFFERED 2017-2018 - Process Control II W | 3.5

CHEE 436 NOT OFFERED 2017-2018 - System Identification F | 3.5

CHEE 440 Pharmaceutical Technology W | 3.5

CHEE 450 NOT OFFERED THIS YEAR - Engineering Biology W | 3.5

CHEE 452 Transport Phenomena in Physiological Systems F | 3.5

CHEE 460 Applied Surface and Colloid Science F | 3.5

CHEE 461 Electrochemical Engineering W | 3.5

CHEE 470 Design of Manufacturing Processes F | K 7

CHEE 481 NOT OFFERED THIS YEAR - Air Quality Management W | 3.5

CHEE 484 Bioremediation W | 3.5

CHEE 490 Polymer Formulations and Processing Technology W | 3.5

CIVL 200 Professional Skills I F | K 2.5

CIVL 201 Professional Skills F/W | 2.5

CIVL 210 Chemistry for Civil Engineers F | 4.5

CIVL 215 Materials for Civil Engineers W | 4.5

CIVL 220 Statics and Solid Mechanics F | 4

CIVL 222 Numerical Methods for Civil Engineers W | 5

CIVL 230 Solid Mechanics I F | 4.25

CIVL 231 Solid Mechanics II W | 4.5

CIVL 250 Hydraulics I W | 4

CIVL 260 Deleted - Civil Engineering Design I F | 4

CIVL 300 Professional Skills II F | K 2.5

CIVL 330 Structural Analysis F | 3.75

CIVL 331 Structural Steel Design W | 4

CIVL 340 Geotechnical Engineering I F | 3.75

CIVL 341 Geotechnical Engineering II W | 4

CIVL 350 Hydraulics II F | 3.75

CIVL 360 Civil Engineering Design and Practice III W | K4

CIVL 370 Deleted - Fundamentals of Environmental Engineering |

CIVL 371 Groundwater Engineering F | 3.75

CIVL 372 Water and Wastewater Engineering W | 4

CIVL 380 Deleted - Applied Sustainability and Public Health in Civil Engineering |

CIVL 400 Professional Skills III F | 2.5

CIVL 409 Deleted - Engineering Report F | 3.5

CIVL 430 Reinforced Concrete Design F | 3.75

CIVL 431 Infrastructure Rehabilitation W | 4

CIVL 436 Prestressed Concrete W | 4

CIVL 442 Geotechnical Design F | 3.75

CIVL 443 Geoenvironmental Design W | 4

CIVL 450 Municipal Hydraulics F | 3.75

CIVL 451 Lake, Reservoir and Coastal Engineering F | 3.75

CIVL 455 River Engineering W | 4

CIVL 460 Civil Engineering Design and Practice IV FW | K6

CIVL 470 Deleted - Municipal Water Engineering |

CIVL 471 Subsurface Contamination W | 4

CIVL 472 Deleted - ENV TE II: Waste Management |

CIVL 473 Water Resources Systems F | 3.75

CIVL 500 Civil Engineering Thesis FW | K4

CMPE 204 Logic for Computing Science F | 3

CMPE 212 Introduction to Computing Science II F/W | 4

CMPE 223 Software Specifications W | 3

CMPE 271 Scientific Computing W | 3

CMPE 320 Fundamentals of Software Development F | 4

CMPE 322 NOT OFFERED THIS YEAR-Software Architecture W | 3

CMPE 324 Operating Systems W | 3

CMPE 325 Human-Computer Interaction W | 3

CMPE 326 Game Architecture F | 4

CMPE 327 Software Quality Assurance F | 3

CMPE 330 Computer-Integrated Surgery F | 3

CMPE 332 Database Management Systems W | 3

CMPE 333 Introduction to Data Mining F | 3

CMPE 365 Algorithms I F | 4

CMPE 380 Deleted - Algorithms Laboratory F | K 1

CMPE 422 Formal Methods in Software Engineering F | 3

CMPE 425 NOT OFFERED THIS YEAR: Advanced User Interface Design W | 3

CMPE 432 NOT OFFERED THIS YEAR-Advanced Database Systems F | 3

CMPE 434 NOT OFFERED THIS YEAR: Distributed Systems F | 3

CMPE 452 Neural Networks and Genetic Algorithms W | 3

CMPE 454 Computer Graphics W | 3

CMPE 457 Image Processing and Computer Vision F | 3

CMPE 458 Programming Language Processors W | 4

CMPE 471 Computational Biology F | 3

CMPE 472 Medical Informatics W | 3

CMPE 480 Deleted - Computational Biology Laboratory W | K 1

SOFT 423 Software Requirements W | 3

ELEC 210 Introductory Electric Circuits and Machines W | 4.25

ELEC 221 Electric Circuits F | 4.25

ELEC 252 Electronics I W | 4.25

ELEC 270 Discrete Mathematics with Computer Engineering Applications W | 3.5

ELEC 271 Digital Systems F | 4.25

ELEC 273 Numerical Methods and Optimization W | 3.5

ELEC 274 Computer Architecture W | 4

ELEC 278 Fundamentals of Information Structures F | 4

ELEC 279 Introduction to Object Oriented Programming W | 4

ELEC 280 Fundamentals of Electromagnetics W | 3.75

ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |

ELEC 294 Deleted - Electrical and Computer Engineering Laboratory II |

ELEC 299 Mechatronics Project W | K1.5

ELEC 310 Introductory Analog Electronic and Digital Circuits F | 4.5

ELEC 323 Continuous-Time Signals and Systems F | 3.75

ELEC 324 Discrete-Time Signals and Systems W | 4

ELEC 326 Probability and Random Processes F | 3.5

ELEC 333 Electric Machines F | 4.5

ELEC 344 Sensors and Actuators F | 3.25

ELEC 353 Electronics II F | 4.5

ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.25

ELEC 373 Computer Networks W | 3

ELEC 374 Digital Systems Engineering W | 4.25

ELEC 377 Operating Systems F | 4

ELEC 381 Applications of Electromagnetics F | 3.5

ELEC 390 Electrical and Computer Engineering Design W | K2.25

ELEC 408 Biomedical Signal and Image Processing F | 3

ELEC 409 NOT OFFERED 2017-2018 - Bioinformatic Analytics W | 3

ELEC 421 Digital Signal Processing: Filters and System Design F | 4

ELEC 422 NOT OFFERED 2017-2018 - Digital Signal Processing: Random Models and Applications F | 3

ELEC 431 Power Electronics F | 3.25

ELEC 433 Energy and Power Systems W | 3.5

ELEC 436 NOT OFFERED THIS YEAR-Electric Machines and Control W | 3

ELEC 443 Linear Control Systems W | 4

ELEC 444 Modeling and Computer Control of Mechatronic Systems W | 3.25

ELEC 448 Introduction to Robotics: Mechanics and Control W | 3.5

ELEC 451 Digital Integrated Circuit Engineering F | 3

ELEC 454 Analog Electronics W | 3.25

ELEC 457 NOT OFFERED 2017-2018 - Integrated Circuits and System Applications W | 3

ELEC 461 NOT OFFERED 2017-2018 - Digital Communications F | 3.5

ELEC 464 Wireless Communications F | 3

ELEC 470 NOT OFFERED 2017-2018 - Computer System Architecture W | 3.5

ELEC 474 Machine Vision W | 3.5

ELEC 476 DELETED - Modelling and Systems Simulation W | 3.5

ELEC 478 DELETED - Computer Networks II W | 3

ELEC 483 NOT OFFERED 2017-2018 - Microwave and RF Circuits and Systems W | 4.5

ELEC 486 NOT OFFERED THIS YEAR-Fiber Optic Communications F | 3.75

ELEC 490 Electrical Engineering Project FW | K7

ELEC 491 Advanced ECE Thesis I S | 6

ELEC 492 Advanced ECE Thesis II FW | 6

ELEC 497 Research Project FW/S | K3.5

ELEC 498 Computer Engineering Project FW | K7

ENCH 211 Main Group Chemistry F | 4.5

ENCH 212 Principles of Chemical Reactivity F | 3.75

ENCH 213 Introduction to Chemical Analysis F | 4.5

ENCH 222 Methods of Structure Determination W | 3.75

ENCH 245 Applied Organic Chemistry I W | 4.5

ENCH 281 Deleted - General Organic Chemistry I F | 4.5

ENCH 311 Mechanistic Organic Chemistry F | 3.5

ENCH 312 Transition Metal Chemistry F | 3.5

ENCH 313 Quantum Mechanics F | 3.5

ENCH 321 Instrumental Chemical Analysis W | 3

ENCH 322 The Chemical Bond: Computation and Spectroscopy W | 3.5

ENCH 323 Biological Chemistry W | 3

ENCH 326 Environmental and Green Chemistry W | 3

ENCH 345 NOT OFFERED 2017-2018 - Applied Organic Chemistry II W | 3

ENCH 397 Experimental Chemistry FW | 7

ENCH 398 Experimental Chemistry I F | 3.5

ENCH 399 Experimental Chemistry II W | 3.5

ENCH 411 Advanced Analytical Chemistry F | 3

ENCH 412 NOT OFFERED THIS YEAR - Statistical Mechanics W | 3

ENCH 413 NOT OFFERED 2017-2018 Computational Chemistry W | 3

ENCH 414 NOT OFFERED 2017-2018 - Catalysis F | 3

ENCH 415 Electrochemistry and Electrocatalysis F | 3

ENCH 417 Research Project FW | 9

ENCH 421 Advanced Methods in Physical Chemistry F | 3

ENCH 422 Synthetic Organic Chemistry W | 3.5

ENCH 423 Topics in Inorganic and Organometallic Chemistry F | 3

ENCH 424 Polymer Chemistry W | 3

ENCH 425 NOT OFFERED 2017-2018 - Self-Assembly and Materials W | 3

ENPH 211 Applied Physics W | 3.5

ENPH 213 Computational Engineering Physics W | 4

ENPH 225 Mechanics W | 3.5

ENPH 239 Electricity and Magnetism W | 3.5

ENPH 242 Relativity and Quanta F | 3.5

ENPH 251 Deleted - Engineering Physics Laboratory and Statistics FW | 4.25

ENPH 252 Management of Experimental Data W | 1.25

ENPH 253 Engineering Physics Laboratory W | K3.5

ENPH 274 Deleted - Thermodynamics W | 3.5

ENPH 312 DELETED - Mathematical Methods in Physics FW | 7

ENPH 316 Mathematical Methods in Physics I F | 3.5

ENPH 317 Mathematical Methods in Physics II W | 3.5

ENPH 321 Advanced Mechanics W | 3.5

ENPH 332 Deleted - Electromagnetic Theory W | 3.5

ENPH 333 Deleted - Electronics for Scientists and Engineers |

ENPH 334 Electronics for Applied Scientists F | 5

ENPH 336 Solid State Devices W | 3.25

ENPH 344 Introduction to Quantum Mechanics F | 3.5

ENPH 345 Quantum Physics of Atoms, Nuclei and Particles W | 3.5

ENPH 351 Deleted - Engineering Physics Laboratory F | 2

ENPH 352 Deleted - Measurement, Instrumentation and Experiment Design W | 4

ENPH 353 Engineering Physics Laboratory II F | 2.5

ENPH 354 Engineering Physics Design Project W | 3.5

ENPH 372 Thermodynamics W | 3.5

ENPH 380 Deleted - Electrical and Optical Properties of Solids W | 3.25

ENPH 414 Introduction to General Relativity F | 3

ENPH 422 Deleted - Fluid Mechanics F | 3.5

ENPH 431 Electromagnetic Theory F | 3.5

ENPH 444 Advanced Quantum Physics W | 3

ENPH 450 Deleted - Advanced Physics Laboratory and Project FW | 8

ENPH 453 Advanced Physics Laboratory W | 3.5

ENPH 454 Advanced Engineering Physics Design Project F | 4.5

ENPH 455 Engineering Physics Thesis FW | 4

ENPH 456 Advanced Engineering Physics Thesis I S | 2

ENPH 457 Advanced Engineering Physics Thesis II FW | 9

ENPH 460 Laser Optics W | 3.5

ENPH 472 Statistical Mechanics W | 3.5

ENPH 480 Solid State Physics F | 3.5

ENPH 481 Solid State Device Physics F | 3.5

ENPH 483 Nanoscience and Nanotechnology W | 3.5

ENPH 487 Deleted - Surface Engineering and Analysis F | 3

ENPH 490 Nuclear Physics F | 3.5

ENPH 491 Physics of Nuclear Reactors F | 3.5

ENPH 495 Introduction to Medical Physics W | 3

GEOE 107 Deleted - History of Life F | 3.5

GEOE 207 History of Life F | 3.5

GEOE 211 Deleted - Geological Engineering Field Methods F | 4.5

GEOE 221 Geological Engineering Field Methods F | 4.5

GEOE 232 Mineralogy F | 4.5

GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4

GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4

GEOE 249 Geophysical Characterization of the Earth W | 3.5

GEOE 262 Geological Aspects of Mineral Deposits W | 3.75

GEOE 281 Earth Systems Engineering F | 3

GEOE 282 NOT OFFERED THIS YEAR - Earth Systems Engineering II: Resources and Environment W | 3.5

GEOE 300 Geological Engineering Field School S | 5

GEOE 301 Field Studies in Geology F | 1.5

GEOE 310 Deleted - Geological Engineering Field School |

GEOE 313 Geomechanics and Engineering Geology W | 3

GEOE 319 Applied Geophysics W | 4.5

GEOE 321 Analysis of Rock Structures F | 4

GEOE 323 Deleted - Quaternary Glacial Geology |

GEOE 333 Terrain Evaluation W | 4

GEOE 337 Paleontology F | 3.75

GEOE 340 Problems in Geological Engineering F/W | 3

GEOE 341 Special Topics in Applied Geology S | 3

GEOE 343 NOT OFFERED THIS YEAR-Applied Hydrogeology F | 3.75

GEOE 345 Site Investigation & Geological Engineering Design W | 4

GEOE 349 Deleted - Applications of Quantitative Analysis in Geological Engineering W | 3.5

GEOE 359 Applied Quantitative Analysis in Geological Engineering W | 3.5

GEOE 362 Resource Engineering W | 4.5

GEOE 365 Geochemical Characterization of the Earth F | 3.75

GEOE 368 Carbonate Sedimentology F | 4.5

GEOE 401 Field Studies in Geology II F | 1.5

GEOE 402 Deleted - Exploration and Mining Geology Field School (two weeks) |

GEOE 403 Deleted - Geotechnical and Geo-Environmental Field School F | 3

GEOE 409 Deleted - Applied Geophysics: Laboratory F | 5

GEOE 410 Geological Engineering Field School F | 3.5

GEOE 413 Geomechanics and Rock Engineering Design F | 3.5

GEOE 414 Foundations of the Oil and Gas Industry W | 3.5

GEOE 418 Petroleum Geology F | 4.5

GEOE 419 Engineering Geophysics Field School S | 3.5

GEOE 421 Deleted - Igneous Petrology |

GEOE 422 Deleted - Metallogeny and Mineral Exploration |

GEOE 429 Deleted - Geophysical Signal Analysis and Inverse Theory W | 3.5

GEOE 439 Advanced Applied Geophysics W | K3

GEOE 445 Deleted - Site Investigation and Case Histories F | 3.5

GEOE 446 Engineering Design Project I F | K3

GEOE 447 Engineering Design Project II W | K5

GEOE 452 Instrumental Techniques Applied to the Study of Solids W | 3

GEOE 452 Instrumental Techniques Applied to the Study of Solids W | 3

GEOE 462 Advanced Petrogenesis and Metallogenesis W | 4.5

GEOE 463 Spatial Information Management in the Geosciences F | 3.5

GEOE 464 Visualization in Geosciences W | 1.5

GEOE 465 Deleted - Exploration Geochemistry W | 3.5

GEOE 466 Isotopes and the Environment W | 4

GEOE 475 Exploration and Environmental Geochemistry F | 4.3

GEOE 478 Terrigenous Clastic Sedimentology F | 3.5

GEOE 481 Structural Analysis Applied to Resource Deposits W | 3.5

GEOE 485 Deleted - Environmental Aqueous Geochemistry W | 3

GEOE 488 Geology of North America F | 3

GEOL 382 Deleted - Resource Engineering F |

GISC 201 DELETED - Geographic Information Science W | 3

GISC 202 DELETED - Data Collection, Management and Analysis W | 4

GISC 301 DELETED - Spatial Analysis F | 3

GISC 302 DELETED - Environmental Modelling W | 3

GISC 303 DELETED - Application Design and Customization in GIS F | 3

GPHY 304 Arctic and Periglacial Environments W | 3

MBIO 218 NOT OFFERED THIS YEAR-Gene Structure and Function (Molecular Biology) W | 3.25

MICR 360 Immunology F | 3

MDEP 221 Deleted - Engineering and Social Justice: Critical Theories of Technological Practices W | 3

MDEP 437 Fuel Cell Technology F |

MECH 212 Deleted - Design Techniques |

MECH 213 Manufacturing Methods F | 4.5

MECH 215 -NOT OFFERED IN 2017-2018 - Instrumentation and Measurement F | 3.5

MECH 216 NOT OFFERED IN 2017-2018 - Instrumentation and Measurement Labs F | K2

MECH 217 Measurement in Mechatronics F | 4.25

MECH 221 Solid Mechanics I F/S-OL | 4

MECH 228 Kinematics and Dynamics W | 3.5

MECH 230 Thermodynamics I F | 3.5

MECH 241 Fluid Mechanics I W/S-OL | 3.5

MECH 270 Materials Science and Engineering F | 3.75

MECH 271 Deleted - Materials Science and Engineering |

MECH 321 Solid Mechanics II F | 3.5

MECH 323 Machine Design W | 4.5

MECH 328 Dynamics and Vibration F | 3.5

MECH 330 Applied Thermodynamics II F | 3.5

MECH 333 -NOT OFFERED THIS YEAR - Gender, Engineering and Technology W | 3

MECH 341 Fluid Mechanics II W | 3.5

MECH 346 Heat Transfer W | 3.5

MECH 350 Automatic Control W | 3.5

MECH 361 Project Based Engineering: Conceive, Design, Implement and Operate W | K3.5

MECH 370 Principles of Materials Processing F | 3.5

MECH 371 Fracture Mechanics and Dislocation Theory W | 3.5

MECH 391 Deleted - Technical Communication - Advanced |

MECH 393 Biomechanical Product Development F | 3.5

MECH 396 Mechanical and Materials Engineering Laboratory I F | K3

MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

MECH 398 Mechanical Engineering Laboratory I F | K3

MECH 399 Mechanical Engineering Laboratory II W | K2

MECH 420 Vibrations W | 3.5

MECH 423 Introduction to Microsystems W | 3.5

MECH 424 NOT OFFERED THIS YEAR - Sustainable Product Design W | 3.5

MECH 430 NOT OFFERED THIS YEAR-Thermal Systems Design F | 4

MECH 435 Internal Combustion Engines W | 3.5

MECH 439 Turbomachinery F | 3.5

MECH 441 NOT OFFERED THIS YEAR - Fluid Mechanics III W | 3.5

MECH 444 Computational Fluid Dynamics F | 3.5

MECH 448 Compressible Fluid Flow F | 3.5

MECH 452 Mechatronics Engineering F | 5

MECH 455 Computer Integrated Manufacturing F | 3.5

MECH 456 Introduction to Robotics F | 3.5

MECH 458 DELETED - Machine Condition Monitoring and Fault Diagnostics F | 3.5

MECH 460 Team Project - Conceive and Design F | K4

MECH 461 Research Project W | K4

MECH 462 Team Project - Implement and Operate W | K3.5

MECH 463 Engineering Project for International Students F/W | K 2

MECH 464 Communications and Project Management F | 1.5

MECH 465 Computer-Aided Design F | 3.5

MECH 470 Deformation Processing W | 3.5

MECH 474 Deleted - Functional Ceramics |

MECH 475 Deleted - Structural Ceramics |

MECH 476 NOT OFFERED THIS YEAR-Engineering of Polymers and Composite Materials W | 3.5

MECH 478 Biomaterials F | 3.5

MECH 479 Nano-Structured Materials W | 3.5

MECH 480 Airplane Aerodynamics and Performance W | 3.5

MECH 481 NOT OFFERED THIS YEAR-Wind Energy F | 3.5

MECH 482 NOT OFFERED THIS YEAR-Noise Control W | 3.5

MECH 483 Nuclear Materials F | 3.5

MECH 484 Introduction to Ceramics F | 3.5

MECH 492 Biofluids W | 3.5

MECH 494 Kinematics of Human Motion F | 3.5

MECH 495 Ergonomics and Design W | 3.5

MECH 496 Musculoskeletal Biomechanics F | 3.5

MINE 201 Introduction to Mining and Mineral Processing F | 4

MINE 202 Computer Applications and Instrumentation in Mining F | 1.5

MINE 244 Underground Mining W | 3

MINE 262 Deleted - Engineering Surveying S | 3.5

MINE 267 Applied Chemistry for Mining W | 3.5

MINE 268 Analytical Methods in Mining W | 1

MINE 307 Front Line Supervision W | 1.5

MINE 321 Drilling and Blasting F | 4.5

MINE 324 Hydraulics for Mining Applications W | 3.5

MINE 325 Applied Rock Mechanics W | 4.5

MINE 326 Operations Research W | 4.5

MINE 330 Mineral Industry Economics W | 3.5

MINE 331 Methods of Mineral Separation F | 4.5

MINE 338 Deleted - Mine Ventilation |

MINE 339 Mine Ventilation F | 4.5

MINE 341 Open Pit Mining F | 4.5

MINE 422 Mining and Sustainability F | 4

MINE 434 Project Report F/W | 4

MINE 445 Open Pit Mine Design W | 5.5

MINE 448 Underground Design W | 5.5

MINE 451 Chemical Extraction of Metals F | 3

MINE 455 Design, Analysis and Operation of Mineral Processes F | 4.5

MINE 458 Process Investigations W | 4

MINE 459 Reliability, Maintenance, and Risk Assessment F | 4

MINE 460 Special Topics in Mining Engineering F/W | 4.5

MINE 462 Occupational Health and Safety in Mining Practice F | 3.5

MINE 467 Geostatistics and Orebody Modelling F | 4.5

MINE 469 Stability Analysis in Mine Design F | 4

MINE 471 Mine-Mechanical Design Project W | 5.5

MINE 472 Mining Systems, Automation, and Robotics O/L | K3.5

MNTC P01 Engineering Mathematics F/OL | 3

MNTC P02 Mining Geology W/OL | 3

MNTC P03 Foundational Mathematics W/OL | 3

MNTC P04 Calculus S/OL | 3

MNTC P05 Foundational Physics W/OL | 3

MNTC P06 Foundational Chemistry F/OL | 3

MNTC P07 Surveying Principles W/OL | 3

MNTC 301 Technical Writing and Communication F/OL | 3

MNTC 302 Engineering Physics F/OL | 3

MNTC 303 Engineering Chemistry F/OL | 3

MNTC 304 Applied Metrology and Data Analysis W/OL | 3

MNTC 305 Introduction to Mining F/OL | 3

MNTC 306 Mineral Processing Unit Operations W/OL | 3

MNTC 307 Geomechanics and Ground Control W/OL | 3

MNTC 308 Mine Health and Safety W/OL | 3

MNTC 309 Engineering Economics F/W/S/OL | 3

MNTC 310 Mining and Society S/OL | 3

MNTC 311 Ore Body Modelling and Resource Estimation F/W/S | 3

MNTC 312 Business Law and Ethics W/S | 3

MNTC 313 Introduction to Computer Programming for Engineering Applications W/OL | 3

MNTC 314 Drilling and Blasting W/OL | 3

MNTC 399 Field School I (Kingston) S | 5

MNTC 413 Surface Mine Design S/OL | 3

MNTC 414 Underground Mine Planning F/OL | 3

MNTC 415 Metal Extraction Processes F/OL | 3

MNTC 416 Ventilation and Hydraulics F/OL | 3

MNTC 417 Mine Services II: Power, Communications and Compressed Air F/W/S/OL | 3

MNTC 418 Sustainability and the Environment S/OL | 3

MNTC 419 Mine Supervision and Project Management W/OL | 3

MNTC 420 Physical Asset Management for Mining Equipment W/OL | 3

MNTC 421 Leadership Management S/OL | 3

MNTC 422 Soft Rock Mining and Processing F/W/S/OL | 3

MNTC 423 Geomatics S/OL | 3

MNTC 425 Ore Body Modelling and Resource Estimation S/OL | 3

MNTC 426 Business Law and Ethics S/OL | 3

MNTC 498 Capstone Project S/OL | 3

MNTC 499 Field School II (Timmins) S | 5

MTHE 212 Linear Algebra W | 3.5

MTHE 217 Algebraic Structures with Applications F | 3.5

MTHE 224 Applied Mathematics for Civil Engineers F | 4.2

MTHE 225 Ordinary Differential Equations F/W/S-OL | 3.5

MTHE 227 Vector Analysis F | 3

MTHE 228 Complex Analysis W | 3.5

MTHE 232 Deleted - Differential Equations |

MTHE 235 Differential Equations for Electrical and Computer Engineers F | 3

MTHE 237 Differential Equations for Engineering Science F | 3.25

MTHE 272 Application of Numerical Methods W | 3.5

MTHE 280 Advanced Calculus F | 3.5

MTHE 281 Introduction to Real Analysis W | 3.5

MTHE 312 Deleted - Linear Algebra |

MTHE 326 Functions of a Complex Variable F | 3.5

MTHE 332 Introduction to Control W | 4

MTHE 333 Deleted - Control-Robotics Lab I |

MTHE 334 Mathematical Methods for Engineering and Physics F | 3.5

MTHE 335 Mathematics of Engineering Systems W | 3.5

MTHE 337 NOT OFFERED THIS YEAR - Introduction to Operations Research Models W | 3

MTHE 338 Fourier Methods for Boundary Value Problems F | 3.5

MTHE 339 Evolutionary Game Theory W | 3

MTHE 351 Probability I F | 3.5

MTHE 353 Probability II W | 3

MTHE 367 Engineering Data Analysis W | 3.5

MTHE 393 Engineering Design and Practice for Mathematics and Engineering W | K4

MTHE 406 Not Offered 2017-2018 - Introduction to Coding Theory F | 3

MTHE 418 Number Theory and Cryptography F | 3

MTHE 430 Modern Control Theory F | 4

MTHE 434 NOT OFFERED THIS YEAR - Optimization Theory and Applications F | 3.5

MTHE 437 Deleted - Topics in Applied Mathematics | 3

MTHE 439 Lagrangian Mechanics, Dynamics, and Control W | 3.5

MTHE 454 NOT OFFERED THIS YEAR - Statistical Spectrum Estimation W | 3

MTHE 455 Stochastic Processes and Applications F | 3.5

MTHE 472 Control of Stochastic Systems W | 3

MTHE 474 Information Theory F | 3

MTHE 477 Data Compression and Source Coding W | 3

MTHE 478 NOT OFFERED THIS YEAR - Topics in Communication Theory F/W | 3

MTHE 484 NOT OFFERED THIS YEAR - Data Networks W | 3

MTHE 493 Engineering Mathematics Project FW* | K7.5

MTHE 494 Mathematics and Engineering Seminar F | 3

SOFT 437 NOT OFFERED 2017-2018 - Performance Analysis W | 3

SURP 844 Real Estate Planning and Development W | 3

SURP 851 Environmental Policy W | 3

SURP 853 Environmental Services W | 3

SURP 855 Environmental Planning and Management W | 3

SURP 874 Housing Policy F | 3

MNTC 416 Ventilation and Hydraulics F/W/S/OL | 3

Admission and Fees

Admissions

Information on Admissions

Students who are considering applying to Queen's are directed to Queen's Admission Services at: <http://www.queensu.ca/admission>. The Admissions website provides information regarding the admission requirements for all undergraduate programs, facilities and services, residences, scholarships and financial assistance.

Campus Visits

Applicants and potential applicants are encouraged to visit the Queen's campus, as well as the Faculty of Engineering and Applied Science. Formal arrangements can be made by contacting engineering.reception@queensu.ca.

Criteria

Admission is offered to the best qualified students applying. Academic success is the primary criterion for admission to Engineering and Applied Science. Students whose academic performance exceeds a required minimum will receive an offer of admission. In all other cases, students will be evaluated on a combination of their academic and non-academic achievements. Submission of a completed Personal Statement of Experience (PSE) form is required for all first year applicants.

Fees

The Board of Trustees reserves the right to make changes in the scale of fees if, in its opinion, circumstances so warrant.

Tuition Fees

Tuition fees are reviewed each year and are dependent on government funding and regulation. Specific information on tuition levels is available on the Web at <http://queensu.ca/registrar/financials/tuition-fees>. Students are encouraged to become familiar with this information.

Ancillary Fees

Students may be required to pay ancillary fees for course related learning materials, safety equipment and field trips. The maximum estimated compulsory fees for specific academic plans are shown below. Those plans not listed do not have ancillary fees. In most cases the actual cost to individual students will be less than the amount indicated.

First Year	\$	179
Geological Engineering ¹		1,901.5
Mechanical Engineering ²		75
Mining Engineering ³		200

¹See the Geological Engineering Academic Plan section of this calendar for a breakdown and explanation of costs.

²Fee for MECH 370 optional field trip.

³To be confirmed prior to start of the 2017-18 Fall term.

Non-compulsory Fees

Academic Appeal Fee will be refunded if appeal is granted.	\$40.00	Payable through Student Services. See http://engineering.queensu.ca/Current-Students/Registration-Guide/Academic-Regulation-Requests-Waivers-and-Appeals.html for official form and payment information.
Request for Course Substitution (Letter of Permission) To take a course from another university and substitute the course for credit towards Queen's Engineering Degree.	60.00	Payable through Student Services. See http://engineering.queensu.ca/Current-Students/Registration-Guide/Academic-Regulation-Requests-Waivers-and-Appeals.html for official form and payment information.
Document Fee For completion of all documents related to registration at Queen's. Includes documents such as proof of enrolment, degree eligibility, course descriptions.	30.00	Payable through Student Services. Contact engineering.reception@queensu.ca to make request and discuss payment.
Exam Rereads Fee will be refunded if the mark increases.	50.00	Payable through Student Services. See http://engineering.queensu.ca/Current-Students/Registration-Guide/Academic-Regulation-Requests-Waivers-and-Appeals.html for official form and payment information.

Internship Program - application fee	35.00	Payable through Student Services. Please contact Micheline Johnston at micheline.johnston@queensu.ca for application and payment information.
Late Application Fee includes late course add/drop, late registration/withdrawal of Supplemental Examinations of J Section Re-write Exams, late Application to Graduate	60.00	Payable through Student Services. See http://engineering.queensu.ca/Current-Students/Registration-Guide/Academic-Regulation-Requests-Waivers-and-Appeals.html for official form and payment information.
Registered Education Savings Plan - form completion Fee includes direct submission of RESP form by registered mail or fax.	30.00	
Required to Withdraw Waiver Request	40.00	Payable through Student Services. See http://engineering.queensu.ca/Current-Students/Registration-Guide/Academic-Regulation-Requests-Waivers-and-Appeals.html for official form and payment information.
Supplemental Examinations	250.00	Payable through SOLUS
Extended Program (Section 900/J-Section) & Rewrite Exams:		
Extended Program - Section 900 per course tuition fee ¹	516.40	Payable through SOLUS
Rewrite Exam - per exam fee (Spring term) ²	466.00 +SAL	Payable through SOLUS
Section 900 or Rewrite Exam - remote exam fee per exam ³	344.00	Payable through Student Services. Please see http://engineering.queensu.ca/Current-Students/First-Year-Studies/Section900/DetailedInformation.html#Rewrite for more information.
Section 900 or Rewrite Exam - remote exam admin fee ³	75.00	Payable through Student Services. Please see http://engineering.queensu.ca/Current-Students/First-Year-Studies/Section900/DetailedInformation.html#Rewrite for more information.

¹2016/17 Extended Program course fee is \$516.40. The course tuition fee is for the 6-week portion of the course that extends past the end of Winter term, and includes Spring term exams in June.

²The Spring 2017 exam fees are assessed under the 2015/16 fee schedule and will be \$466.00, plus \$10.00. (SAL = Student Assistance Levy) per exam.

³Students may choose to write exams in a location other than Kingston. There is a \$344 fee per exam plus an administrative fee of \$75.00 for one or more exams.

Fees quoted are for domestic students. Fees for International students are higher. Please contact the Registrar's Office or refer to the Guide to Registration and Fees at <http://www.queensu.ca/registrar/> for details. In case of differences between the above and the Guide, the fees shown in the Guide shall prevail.

Account Information

Students can use SOLUS to determine their account balances.

Student Services Fee Payments

Fee payments that are made through our Student Services office may be by cheque or credit card/debit. We do not accept cash payments at any time.

No form that requires a Student Services payable fee will be processed without payment.

Cheques are to be made out to "Queen's University".

Credit card payments may be made either in person or over the phone. If a student chooses to make a credit payment over the phone, they must first contact Student Services Reception (613-533-2055 or engineering.reception@queensu.ca), to discuss the process of appropriate authorization to complete the transaction. DO NOT PROVIDE CREDIT CARD NUMBERS AT ANYTIME, VIA EMAIL.

Debts

Any student with an overdue debt with the University will not be permitted to register or to receive examination results, official transcripts, or marks reports until the outstanding account is settled in full. A Senate Regulation forbids the release of a diploma to a student in debt to the University.

Questions

Questions about fees or charges should be directed to:

Office of the University Registrar
Gordon Hall
Queen's University
Kingston, Ontario
K7L 3N6
Telephone: 613 533-6894

Please refer to the *Guide to Registration and Fees* (<http://www.queensu.ca/registrar>) for a comprehensive outline of the items referred to above.

Faculty Policies and Regulations

The Faculty of Engineering and Applied Science may be obliged to make changes to the curricula, academic plan descriptions, and course descriptions in this Calendar.

In that case, the corrections will appear in the Minutes of the Faculty Board. In the event of discrepancies between statements that appear on the Faculty Web Sites and the corresponding statements in this Calendar and the Faculty Board Minutes, the latter versions will apply. The following policies and regulations apply to all students registered in the Faculty of Engineering and Applied Science.

The Faculty intends its students to have as much opportunity as possible to develop their individual interests and abilities. Its regulations, academic plans and fields of study have been developed with this goal in mind. The plans, curricula and courses of study are, however, constrained by many factors including accreditation requirements, timetabling, physical facilities, number of staff and the interests of faculty members. The current offerings have been designed in the light of experience and of these restrictions to provide a sufficiently diverse selection to satisfy the interests of most students. However, some students may have valid reasons for seeking variations from the prescribed programs and the regulations include provision for doing so (see Regulations 2d and 2e).

Faculty Policies

Academic Integrity

Honesty in a University is an essential component in maintaining high ethical standards. In preparing students for the profession of engineering, the Faculty of Engineering and Applied Science must send a clear message that high standards are expected. Consistent with this message, students are entitled to an environment where individual performance can be presented and evaluated as fairly as possible. Courses and assignments vary in the amount of collaborative versus individual work that is expected, and the intention of the instructor must be clear to the student. Similarly, the physical setting for examinations should allow individual work where invigilation need not be intrusive. The type and amount of any information that a student may take into an examination must be clearly known ahead of time and of a nature that can be easily verified.

The detailed Academic Integrity Policies and Procedures are on-line at:
<http://engineering.queensu.ca/policy/Honesty.html>

Student Responsibility with respect to Academic Plan and Registration

Students are responsible for ensuring that their course registrations are accurate and complete, and that the courses in which they register meet the requirements for graduation. Course prerequisites and any restrictions on enrolment should be noted carefully prior to registration. The Chair of Undergraduate Studies for the academic plan, or the year advisors in the department, should be consulted whenever requirements are not fully understood.

Calculators in Examinations

From September 2012 onwards, there will be no sticker system for approved calculators. The Casio 991 will be the only calculator approved for engineering exams.

If you attend an exam with an unapproved calculator (non- Casio 991), then it will be removed from you. An instructor will not be able to override this policy.

Release of Examination Papers

Final examination question papers will be made available to students by the end of September (for the previous academic year) through publication in the Exambank (see <http://www.queensu.ca/registrar/exams/>).

In exceptional circumstance the Associate Dean (Academic) may grant an exemption from this policy. Exemptions, granted only on an annual basis, require written justification from the instructor and a supporting letter from the Head of the Department. There should be no expectation of renewal of an exemption decision.

Faculty Regulations

1. Registration

- a. A student must register within the first two weeks of the commencement of term.
- b. A student may change registration from one program to another only within the first week of the commencement of a term and with the approval of the Associate Dean (Academic) and the Department Heads concerned.*
- c. The addition of a course after the prescribed "add course" deadline requires approval of the course instructor, the department in which the student is registered, and the Operations Committee.
- d. A student may withdraw voluntarily from a Fall Term course or a Winter term course prior to the deadline to drop without academic penalty. If so dropped, the course is removed from student record.
- e. Withdrawal from a course after the prescribed deadline to drop without academic penalty requires the approval of the department and the Operations Committee, and will only be permitted in exceptional circumstances. Withdrawals such as these will be indicated on the student's transcript by the designation DR (see Regulation 3c).
- f. A student may add an Extended Program offering of a Fall Term course, or apply to rewrite a Fall Term examination, only within the first three weeks after the commencement of Winter Term and may drop such a course only within the first four weeks after the commencement of Winter Term. A student may add an Extended Program offering of a Winter Term course only within the first nine weeks after the commencement of Winter Term and may drop such a course only before the end of regular Winter Term classes.*
- g. A student who wishes to rewrite second term examinations of the first year when they are offered at the end of the Extended Program may register to do so only within the first two weeks of the Summer Term, and may cancel this registration without academic penalty only within the first three weeks of the Summer Term.*

2. Programs of Study

- a. Students must obtain written approval from Student Services, FEAS, to add or drop first year courses.
- b. A student who is registered in the Regular First Year Program for Winter Term courses may register to rewrite the final examination in any failed course at the next examination period only if the student's Engineering Sessional GPA (ESGPA) is at least 0.7.
- c. An upper year student may request an exemption in a course by application to the Operations Committee or delegate on the basis of knowledge acquired through practical experience. Approval for a request for a course exemption must be recommended by the course instructor and by the Department, on the basis of a satisfactory assessment of the student's proficiency in the exempted course material. A replacement course of similar level, total weight, and CEAB units must be proposed in the exemption application. If the exemption is granted the student must take and pass the specified replacement course.
- d. An upper year student may request an exemption in a course by application to the Operations Committee or delegate on the basis of knowledge acquired through studies prior to first admission to the FEAS. Approval for a request for a course exemption must

be recommended by the course instructor and by the Department, on the basis of a satisfactory assessment of the student's proficiency in the course material. A replacement course of similar level, total weight, and CEAB units must be proposed in the exemption application. If the exemption is granted the student must take and pass the specified replacement course.

- e. An upper year student may request permission for substitution of a course in his/her program by a similar course, either at Queen's or elsewhere, by application to the Operations Committee prior to enrolling in the substitute course. Approval for a request for a course substitution must be recommended by the instructor of the prescribed course and the Department. For courses other than Complementary Studies, the request will normally only be considered if the institution offering the course has an accredited engineering program and if the student has an Engineering Cumulative Grade Point Average (ECGPA) of at least 1.6. If a request to take a substitute course at another institution is approved, the FEAS will issue a Letter of Permission to allow the student to enroll in the course.
- f. A student seeking a degree in Engineering and Applied Science may not receive more than two years of credits for work done in another Faculty or university, and such credits may not encompass more than one half of the courses of the third and fourth years of the program. Additionally, at least one half of the fourth year of the program must be taken at Queen's.
- g. A student who has not passed all of the courses of the first year which are specified as prerequisite to any course in the chosen upper year program must, during the next session, follow a special Fall and Winter term program arranged by the Chair of Undergraduate Studies of the chosen department. During this session, the student must pass all prerequisite courses during the session or he or she will be required to withdraw.*
- h. Regulation 2h has been removed since it is now covered under Regulation 10. (Removed May 1, 2011)

3. Course Weighting

- a. Each course in the Calendar of the Faculty of Engineering and Applied Science is assigned a weight as specified in the Calendar. A weight of 1 unit is given for each 12 lecture hours in a course, with 0.5 units given for every 12 tutorial hours, and 0.5 units for every 12 lab hours. The multiplying factor to convert from "units" to CEAB accreditation units (AUs) is 12, i.e. 1 unit = 12 AUs. When engineering students take courses outside the FEAS they must use the unit weighting assigned by the Faculty hosting the course.*
- b. The following table indicates the grading system used in the FEAS, including permitted letter grades, associated grade points, and equivalent percentage marks. If percentage marks are submitted by instructors, these will be converted to letter grades and grade points and will not be used in the evaluation of student progress or academic standing.

Letter Grade	Grade Points	Numeric Equivalent
A+	4.3	90-100%
A	4.0	85-89%
A-	3.7	80-84%
B+	3.3	77-79%

B	3.0	73-76%
B-	2.7	70-72%
C+	2.3	67-69%
C	2.0	63-66%
C-	1.7	60-62%
D+	1.3	57-59%
D	1.0	53-56%
D-	0.7	50-52%
FR	0.0	40-49%
F	0.0	0-39%

- c. Non-evaluative grades: The following is a list of the possible nonevaluative grades and their uses.

Incomplete (IN):

Incomplete standing (IN) is a temporary designation reserved for a course in which a student who, because of extenuating circumstances beyond his or her control, has not completed all term work for a course or requests permission to defer the writing of a final examination. All Incomplete designations require submission of documentation to verify the extenuating circumstances, and must be approved by the Operations Committee of the FEAS. Approval of the instructor must be obtained, and a date set for the completion of the work (normally within 9 months of approval). An IN designation will revert to the "default grade" submitted by the instructor after the date set for completion of the work.

Pass in a Pass/Fail Course (P)

A Pass standing (P) is reserved for a course in which the student successfully completes all of the requirements in a course designated as Pass/Fail. A course that has been designated as Pass/Fail will not be included in the student's grade point average but can be counted as credit towards a degree program.

Dropped (DR)

The Dropped (DR) designation indicates a course that has been dropped after the deadline to drop without academic penalty. This designation can only be applied with approval from the Operations committee.

Failure with Review (FR)

For information, please see Regulation 14 - Supplemental Examinations

4. Standing in a Course

- a. The passing grade for a course is D- or above, or P. The basis upon which the final grade is assigned, including the weight given to term work, should be made available to students by the instructor at the beginning of a course.
- b. If a student is unable to write the final examination or to submit required coursework because of incapacitating illness or other extenuating circumstances, a temporary designation of IN (incomplete) will be recorded for the course on the recommendation of the course instructor, the Department Head, and upon approval by the Operations Committee of the FEAS (see regulation 3c). The submission of a mark of IN must be accompanied by documents verifying the extenuating circumstances, and by a proposed date of completion which should be as early as possible, but no later than 9 months beyond the date of approval. The course for which a mark of IN has been entered will be excluded when calculating the Engineering Sessional and Cumulative Grade Point Averages of the student concerned. An IN on a transcript does not preclude the application of Regulations 2g or 10. An IN designation will revert to the "default grade" submitted by the instructor after the date set for completion of the work.

5. Conduct and Attendance

- a. A student may, for any form of departure from Academic Integrity, or misconduct in an academic setting, incur penalties up to and including the requirement to withdraw under Regulation 11d.
- b. A student who claims illness or compassionate grounds as a reason for missing any required component of the course other than the final exam is responsible for making alternative arrangements with the instructors concerned. Verifying documentation is normally not required for short-term extenuating circumstances. If there is a significant effect on attendance or academic performance such that the student may wish to request an incomplete (GD) grade, the student is responsible for providing appropriate documentation to the Operations Committee. Refer to Academic Regulation 4b for procedures and documentation required to request an incomplete grade. In the case of illness, a medical certificate should be requested at the time of the treatment.

6. Examinations

- a. Candidates are referred to the Exam Regulations located on the website of the University Registrar.

7. Requirements for Graduation*

To qualify for the degree of Bachelor of Applied Science (B.A.Sc.) in engineering, in the FEAS, a student must, at the end of not more than six calendar years from date of first registration in the Faculty:

- a. have passed all the courses required in the First Year program;
- b. have passed all courses required by the department in which she or he is registered;
- c. while registered in their engineering program, have passed courses whose units total is not less than the minimum required by the department in which he or she is registered and each course may be counted only once;
- d. have achieved an Engineering Cumulative Grade Point Average (ECGPA) of 1.6 or higher;
- e. have successfully completed field and technical excursions required by the department in which he or she is registered;
- f. have passed the English Proficiency Test;
- g. have satisfied the minimum curriculum content specified by the CEAB in each content category;

A student who has not completed the degree program in six years will normally be required to withdraw. An extension will normally be granted to students who have completed, or are working on an Internship, Exchange, or are enrolled in a Dual Degree program, or have received accommodation through the Queen's Disability Services office due to a disability. If a student is allowed to continue, on successful appeal of this regulation, his/her program of study will be reviewed by the Department and the Faculty. Extra courses may be required to permit completion of the degree program within an

agreed time limit. As a result of the review, possible changes to the student's required program will include but not be limited to the following:

- Courses which have changed significantly in content may have to be retaken.
- Additional courses which have been added to the degree program may be required for graduation.
- Courses which are no longer part of the degree program may not count toward the degree.

8. **Scholarship**

To be eligible for scholarship awards, a student must take in one session all the courses, including electives, prescribed for the year of the program in which he or she is registered. An exception will be made if any of these courses have been completed previously with a grade of C- or higher. In that event other courses of equivalent total weight and approved by Operations Committee for scholarship purposes must be added to the student's program. Substitutions granted under Regulation 2e are also acceptable.

9. **Graduation with Honours Standing**

A student will be granted the status of graduation "with Second Class Honours" if, upon graduation, she or he has attained either an ECGPA or an EGGPA of 2.2 or higher. A student will be granted the status of graduation "with First Class Honours" if, upon graduation, she or he has attained either an ECGPA or an EGGPA of 3.5 or more.

10. **Academic Probation and Requirement to Withdraw***

Academic Probation

- a. A student shall be placed on Academic Probation, at the time of their academic standing assessment, if he or she:
 - i. has an ECGPA of less than 1.6 at the end of the winter term;
 - ii. returns to studies after having previously been Required to Withdraw. The academic standing "Placed on Academic Probation" shall be placed on the student's transcript.
- b. A student under Academic Probation must follow a special program for the next Engineering Session:
 - i. Students having an ECGPA < 1.3 must repeat all courses in their previous Engineering Session for which they obtained a grade less than C-.
 - ii. Students with $1.3 \leq \text{ECGPA} < 1.6$, or students returning to studies after being previously Required to Withdraw, must repeat courses specified by the Associate Dean, in consultation with the program chair for the department in which the student is registered.
 - iii. The Associate Dean, in consultation with the program chair for the department in which the student is registered, may also specify additional probationary conditions to improve the chances of student success, in their program. The total course load for this session must not exceed the AUs prescribed for that year of the program.
- c. Any student who is placed on Academic Probation and who fulfills all of their Academic Probation conditions at the time of their next academic standing assessment shall be released from Academic Probation.
- d. If a student is Required to Withdraw at the time of their academic standing assessment but is currently taking a Spring/Summer course at Queen's University, he/she may complete the term-length course in which he/she is enrolled, but is then required to withdraw at the end of the term.

Requirement to Withdraw, with opportunity to be considered for readmission after one year:

- e. A student whose ESGPA is less than 0.7 at the time of the academic standing assessment has failed the year and is required to withdraw for a period of at least one year, and may be considered for readmission only after one year.

- f. A student who is on Academic Probation under Regulation 10a (i) or 10a (ii) at the time of assessment and does not fulfill all of their conditions of Academic Probation is required to withdraw for a period of at least one year and may be considered for readmission only after one year.

The academic standing "Required to Withdraw for a minimum of one year" shall be placed on the student's transcript.

Requirement to Withdraw, with opportunity to be considered for readmission after a minimum of three years:

- g. A student who has failed a previous year, or who has been previously Required to Withdraw for academic reasons (except for Regulation 2g), and whose ESGPA at the time of their academic standing assessment is less than 0.7 has failed the year and is required to withdraw for a minimum period of three years, and may be considered for readmission only after a minimum of three years.
- h. A student who is on Academic Probation at the time of assessment, does not fulfill all of their conditions of Academic Probation and has previously been required to withdraw (except for Regulation 2g), is required to withdraw for a minimum period of three years, and may be considered for readmission only after a minimum of three years.
The academic standing "Required to Withdraw for a minimum of three years" shall be placed on the student's transcript.

11. Withdrawal

- a. A student having a fall term Grade Point Average less than 0.7 who withdraws voluntarily no later than 31 January is not considered to have failed the year. The student must reapply in order to be considered for readmission to the FEAS.
- b. A student who withdraws voluntarily after 31 January is considered to have failed the year. The student must reapply in order to be considered for readmission to the FEAS.
- c. The Faculty Board may, at any time, require a student whose attendance or work is deemed unsatisfactory, to withdraw. The student must reapply in order to be considered for readmission to the FEAS.
- d. The Faculty Board Committee on Non-Academic Discipline may require a student to withdraw from the Faculty or it may recommend to Senate the student's dismissal from the University because of misconduct in an academic setting. The student must reapply in order to be considered for readmission to the FEAS.
- e. A student who withdraws for any reason, or is not registered in the FEAS for twelve consecutive months, must reapply in order to be considered for readmission.

12. Readmission

- a. A student applying for readmission after a failed year must present evidence that he or she is likely to succeed in completing the degree in the program for which readmission is sought. The student shall not be readmitted unless the Operations Committee is satisfied that this evidence, together with the student's academic record at Queen's, indicates probable success in completing the degree, and that space is available in the required program. A failed year or a withdrawal from a program in engineering at another university will be treated as if it had occurred at Queen's University.
- b. A student readmitted after a failed year will be placed on Academic Probation and must follow a program constrained by the appropriate requirements outlined under Regulation 10b. In addition, during the first year of registration following a failed year the total unit weight of courses in the student's program shall not exceed that of the regular program of the failed year. As outlined in Regulation 10f and 10h, this student must fulfill all of their conditions of Academic Probation or be required to withdraw.

13. Review and Rereading of Examination Papers

A student who wishes to have a paper reread must make written application to the FEAS within four weeks of the release of the results. The application is to be accompanied by the rereading fee.

Students have the right of access to their final examination papers. As a first step, the student should request an informal review with the instructor concerned, and instructors are strongly encouraged to consent. If the request for an informal review is denied or if the student is not satisfied with the decision, the student may submit a formal appeal to the FEAS. The appeal must be submitted in writing to the FEAS within four weeks of the release of results.

(The attention of students is directed to the Senate Policy on Student Access to Final Examinations and to Regulation 14b regarding the deadline for applying to write a supplemental examination).

14. Supplemental Examinations*

- a. A student receiving a grade of FR (Failure with Review) may be permitted to write a supplemental examination in a failed upper year course offered in the FEAS provided the student has an ECGPA of 1.6 or higher and an ESGPA of 0.7 or higher. Supplemental examinations will be held at Queen's University in September. The privilege of writing these supplemental examinations will be confined to the September following the session in which the failure occurred, and limited to a maximum of three examinations in the student's degree program, with no more than two in any calendar year.
- b. A student requesting permission to write a supplemental examination must apply in writing to the FEAS by June 12 following the session in which the failure occurred. A student may cancel a request for a supplemental examination and the examination fee will be refunded if written notice of the cancellation is received by the FEAS by 15 August following the session in which the failure occurred.
- c. The result obtained on a supplemental examination will be substituted for that of the previous final examination in producing the final grade for the course. A student failing to write a supplemental examination for which he or she is registered and who has not canceled his or her registration by 15 August will be awarded a final grade of F on the supplemental examination. The final grade for a course which is based on a supplemental examination will be included in the ECGPA for the next Engineering Session and in the EGGPA. It will not be included in any ESGPA.
- d. Any student who completes more than one rewrite examination in any individual first-year course will have the total number of supplemental examinations permitted reduced by one for each additional rewrite.

15. Written English Proficiency

- a. A student must, within the first academic term of first registration, take a written English Proficiency Test as specified for students registered in the FEAS.
- b. Upon successful completion of the English Proficiency Test, the designation "English Proficiency Test Passed" will be added to the student transcript.
- c. A student must pass the English Proficiency Test or an equivalent test, approved by the Associate Dean (Academic), to be eligible for graduation.

16. Averages

- a. The Grade Point Averages (GPAs) used in determining a student's standing are calculated by multiplying the grade points earned in a course by the unit value of that course, summing the products so obtained for all the courses in a given period, and dividing this sum by the total number of units attempted during that given period of time over which the GPA is calculated. Each course is only counted once in calculating either the ECGPA or ESGPA. When, during the period considered, a course or a course examination is repeated or replaced by a substitution approved by the Operations Committee, only the most recently obtained mark will be used in calculating the GPA.
- b. The "Academic Year" concludes at the end of winter term, and includes the previous three consecutive terms (summer, fall, winter). An "Engineering Session" is defined as the Fall and Winter terms of the academic year, provided the student is registered in the FEAS for these sessions. The Engineering Sessional Grade Point Average (ESGPA) is the Grade Point Average of all courses taken in the Engineering Session of an academic year, while the student is registered in the FEAS. Queen's courses taken during the summer term of

the academic year will also be included in the ESGPA*. Decisions regarding yearly academic progress will be based on the ESGPA.

- c. The Engineering Cumulative Grade Point Average (ECGPA) is the Grade Point Average of all courses taken in the Fall and Winter terms of all academic years, while the student is registered in the FEAS. Queen's courses taken during the summer term of the academic year will also be included in the ECGPA*. The Engineering Graduation Grade Point Average (EGGPA) is calculated after all degree requirements have been met and follows the same calculation method as the ECGPA, except that it excludes courses that are part of the First Year Curriculum.
- d. The Engineering Graduation Grade Point Average (EGGPA) is calculated after all degree requirements have been met and follows the same calculation method as the ECGPA, except that it excludes courses that are part of the First Year Curriculum.
- e. Academic status of each student is assessed once a year, at the end of the Winter term. Decisions regarding yearly academic progress will be based on the ESGPA. Students on Academic Probation will only be considered for release from probation if they have taken a minimum of 12 units since their previous assessment.

17. **Special Students**

Students may be allowed to take courses in the FEAS without being registered in a degree program. Such students are defined as "Special Students" and must apply to the Faculty before taking additional courses. A Special Student may apply for admission as a regular student proceeding to a degree but, once admitted as a regular student, a student may not re-register as a Special Student before completing a degree in the FEAS.

** Does not apply to Bachelor of Mining Engineering Technology (BTech)*

18. **Regulations Specific to the Bachelor of Mining Engineering Technology program**

Students enrolled in the Bachelor of Mining Engineering Technology ("BTech") program have specific Bridge Course requirements, as well as specific regulations relating to Requirements for Graduation (replacing Regulation 7), and Academic Probation and Requirements to Withdraw (replacing Regulation 10). The following Regulations apply to BTech students:

a. **Bridge Course Requirements - BTech (MINE)**

Upon admission to the BTech program, each student will be enrolled in specific, required, Bridge courses based on their previous academic history. The required Bridge courses for each student may be different, and will be determined by the Associate Dean (Academic) in consultation with the Program Chair for the BTech (MINE) program. In order to be admitted into the Year 3 of the BTech (MINE) program, a student must pass each required Bridge course with a minimum grade of C-.

b. **Requirements for Graduation - BTech (MINE)**

To qualify for the degree of Bachelor of Mining Engineering Technology in the FEAS, a student must, at the end of not more than ten calendar years from date of first registration in the Faculty:

- i. Have passed all courses required by the BTech (MINE) program
- ii. Have achieved an Engineering Cumulative Grade Point Average (ECGPA) of 1.3 or higher
- iii. Have successfully completed field and technical excursions required by the BTech Program.
- iv. Have passed the English Proficiency Test.

A student who has not completed the degree program within ten years of first registering will normally be required to withdraw. An extension will normally be granted to students who have received accommodation through the Queen's Disability Services office due to a disability. If a student is allowed to continue, on successful appeal of this regulation, his/her program of study will

be reviewed by the BTech (MINE) Program Chair and the Faculty. Extra courses may be required to permit completion of the degree program within an agreed time limit. As a result of the review, possible changes to the student's required program will include but not be limited to the following:

- a. Courses which are no longer part of the degree program may not count toward the degree.
- b. Additional courses which have been added to the degree program may be required for graduation.
- c. Courses which have changed significantly in content may have to be retaken.

d. **Academic Probation and Requirement to Withdraw - BTech (MINE)**

Academic Probation

- i. A student shall be placed on Academic Probation, at the time of their academic standing assessment, if he or she:
 - (1) has an ECGPA of less than 1.3. NOTE: the ECGPA excludes final grades received in Bridge courses.
 - (2) returns to studies after having previously been Required to Withdraw.

The academic standing "Placed on Academic Probation" shall be placed on the student's transcript.

- ii. A student under Academic Probation must follow a special program for the next Engineering Session:
 - (1) Students with an ECGPA less than 1.3, or students returning to studies after being previously Required to Withdraw, must repeat courses specified by the Associate Dean, in consultation with the BTech (MINE) program chair.
 - (2) The Associate Dean, in consultation with the BTech (MINE) program chair, may also specify additional probationary conditions to improve the chances of student success. The total course load for the probationary session must not exceed the maximum number of units prescribed for that year of the program.
- iii. Any student who is placed on Academic Probation and who fulfills all of their Academic Probation conditions at the time of their next academic standing assessment shall be released from Academic Probation.
- iv. If a student is Required to Withdraw at the time of their academic standing assessment but is currently taking a Spring/Summer course at Queen's University, he/she may complete the term-length course in which he/she is enrolled, but is then required to withdraw at the end of the term.

Requirement to Withdraw, with opportunity to be considered for readmission after one year:

- v. A student whose ESGPA is less than 0.7 at the time of the academic standing assessment has failed the year and is required to withdraw for a period of at least one year, and may be considered for readmission only after one year.
- vi. A student who is on Academic Probation under Regulation 18.c.i(1) or 18.c.i(2) at the time of assessment and does not fulfill all of their conditions of Academic Probation is required to withdraw for a period of at least one year and may be considered for readmission only after one year. The academic standing "Required to Withdraw for a minimum of one year" shall be placed on the student's transcript.

Requirement to Withdraw, with opportunity to be considered for readmission after a minimum of three years:

- vii. A student who has failed a previous year, or who has been previously Required to Withdraw for academic reasons, and whose ESGPA at the time of their academic standing assessment is less than 0.7 has failed the year and is required to withdraw for a minimum period of three years, and may be considered for readmission only after a minimum of three years.
- viii. A student who is on Academic Probation at the time of assessment, does not fulfill all of their conditions of Academic Probation and has previously been required to withdraw, is required to withdraw for a minimum period of three years, and may be considered for readmission only after a

minimum of three years. The academic standing "Required to Withdraw for a minimum of three years" shall be placed on the student's transcript.

Senate Policies

From time to time, the Senate of the University adopts policies governing administrative and academic affairs of all members of the University Community, including Undergraduate Students in the Faculty of Engineering and Applied Science. These policies can be found on Senate Websites. The most convenient entry to these is the index can be found at Senate and University-wide policies.

Faculty Regulations must conform with Senate policies. All Faculty Regulations are approved by Senate. Digests of some of the Senate Policies of particular relevance to students in Engineering and Applied Science are given here. The date after the title is the year in which the policy was adopted or most recently amended.

Access and Privacy
Student Appeals, Rights and Discipline (2004)
Policy on Academic Integrity
Student Access to Final Examination Papers
Confidential Exams
Electronic Information Security Policy Framework

Awards and Financial Assistance

Prospective Students

Please visit the Awards website.

Student Financial Assistance

Student Awards, as part of the Office of the University Registrar, plays a key role in supporting the University's mission. Our goal is to ensure that all students have the opportunity to attend Queen's, regardless of their personal financial circumstances. To achieve this, a variety of funding sources may be required.

The Student Awards Office is responsible for administering all merit-based undergraduate funding and all need-based funding for both undergraduate and graduate students. Merit-based (scholarship) funding recognizes and rewards students for their achievement, both academic and extra-curricular. Need-based funding (bursaries, awards, work study, loans and grants) is disbursed to students on the basis of demonstrated financial need. Listed directly below is general information as it pertains to the various student financial assistance programs administered by the Student Awards Office. For more detailed information please refer to either the Student Awards website or contact the office.

Awards Officers are available throughout the year to provide financial advising on budgeting and the various options available to assist students with financing their Queen's education.

For further information:

Office of the University Registrar
Student Awards

Gordon Hall, 74 Union Street
Queen's University
Kingston, Ontario, Canada K7L 3N6
Tel: 613-533-2216
Fax: 613-533-6409
E-mail: awards@queensu.ca
Web: <http://www.queensu.ca/studentawards/>

Government Student Financial Assistance (Loans and Grants)

The federal and provincial governments provide student financial assistance for Canadian citizens, permanent residents, and protected persons studying at the post-secondary level. This assistance is intended to supplement student and family resources and recipients must demonstrate financial need. This assistance is offered in the form of repayable loans and in some cases may also include a limited amount of grant or bursary funding.

The appropriate provincial or territorial authorities will evaluate student applications and will provide funding. Funding options, eligibility criteria and regulations vary by jurisdiction. Students from Ontario will access government student financial assistance through the Ontario Student Assistance Program (OSAP): osap.gov.on.ca. Students from a province or territory outside Ontario must apply for government student financial assistance through their home province or territory.

Other government student financial assistance programs include:

Canada Study Grant for the Accommodation of Students with Permanent Disabilities

This program is designed to assist disabled students with disability-related costs of equipment and/or services associated with their participation in post-secondary studies. Students must first apply for funding from their applicable government student financial assistance program for the current academic year and must demonstrate financial need. Students must also be registered with the Health, Counselling and Disability Services Office at Queen's University.

OSAP Child-Care Bursary

The OSAP Child-Care Bursary is provided to eligible Ontario students who, in relation to their participation in post-secondary studies, incur child-care costs for three or more children.

Ontario Special Bursary

Ontario students with low income and enrolled in part-time studies (as defined by the government - maximum 59% of a full course load in each term of study) due to family responsibilities or other personal circumstances may be eligible. Students must be enrolled in a program leading to a degree or diploma and generally cannot have a previous post-secondary degree or diploma.

Part-time Canada Student Loan/Canada Study Grant (CSG) Program

Canadian citizens and permanent residents with low income and enrolled in part-time studies (as defined by the government - maximum 59% of a full course load in each term of study) may be eligible. Students must be residents of a province or territory that participates in the Canada Student Loans program. To qualify for the CSG students must be studying part-time due to family responsibilities or other personal circumstances.

Work Study Program

Queen's University and the Government of Ontario fund this program. The objective is to provide an opportunity for students in financial need to receive priority for certain part-time jobs, generally on-campus, during the academic terms. Applications for the Fall-Winter academic session are available in May and applications for the Spring-Summer academic session are available in February.

General Bursaries

Queen's University bursary assistance is granted after the student's own financial contribution to the cost of his/her education, parental assistance, government aid assistance, or a bank line of credit have been exhausted. Financial need is the primary consideration in the granting of a bursary.

In order to be considered for the majority of Queen's bursaries, including the ones specifically pertaining to Engineering and Applied Science students, students need to complete a single General Bursary application form (unless otherwise noted in the terms of the awards), which is available from the Student Awards website. The deadline for this application is 31 October. If a student is not granted an Engineering and Applied Science bursary or award he/she is still eligible to receive General Bursary funds. Funds will be distributed at the beginning of Winter Term. Bursaries and awards are paid to the student's tuition account if a balance is owing, and any remaining funds are paid by cheque or electronic funds transfer. The values of the bursaries and awards are variable, unless otherwise noted. For complete terms of these, and other named bursaries and awards see the Student Awards website.

Short-term Loans

Short-term loans (of 90 days or less) may be granted in emergency situations if a full-time student is experiencing temporary cash-flow difficulties and can provide satisfactory evidence that he/she will have sufficient resources to repay the loan on or before the due date. Short-term loans are approved on the basis of financial need to assist students in meeting those expenses normally incurred in support of attendance at the University during the current academic session.

Entrance Awards

Queen's Entrance scholarships, bursaries and awards are not listed in this Calendar. Details on these awards are available on the Student Awards web-site or in the Viewbook brochure. The Viewbook should be available in the Guidance Offices of secondary schools or may be obtained by writing to the Office of the University Registrar (Admission Services), Queen's University, Kingston, ON K7L 3N6

Scholarships

Queen's upper-year scholarships are generally available to full-time students in their respective faculty/school and who will be returning to full-time studies in the year following the award. For the most part, separate applications are not required. Candidates will be considered for those awards for which they are eligible in competition with all other qualified candidates. In instances where a scholarship application is required, specific instructions about the application process are given in the description of the award.

General Awards

Queen's University bursary assistance is granted after the student's own financial contribution to the cost of his/her education, parental assistance, government aid assistance, or a bank line of credit have been exhausted. Financial need is the primary consideration in the granting of a bursary.

In order to be considered for the majority of Queen's bursaries, including the ones specifically pertaining to Engineering and Applied Science students, students need to complete a single General Bursary application form (unless otherwise noted in the terms of the awards), which is available from the Student Awards website at <http://www.queensu.ca/studentawards/>. The deadline for this application is 31 October. If a student is not granted an Engineering and Applied Science bursary or award he/she is still eligible to receive General Bursary funds. Funds will be distributed at the beginning of Winter Term. Bursaries and awards are paid to the student's tuition account if a balance is owing, and any remaining funds are paid by cheque or electronic funds transfer. The values of the bursaries and awards are variable, unless otherwise noted. For complete terms of these, and other named bursaries and awards see the Student Awards website.

First Year Awards

William and Beatrice Alder Scholarships

Awarded annually to students entering the second year of the Mathematics and Engineering program or the Engineering Physics program who have obtained First Class standing. Two awards are available.

William Coombs Baker Memorial Prize (Book Prize)

Founded by graduates in memory of William Coombs Baker, formerly the Robert Waddell Professor of Experimental Physics at Queen's. Awarded annually to the student with the highest standing in APSC 111.

Robert Bruce Scholarships

Established under the terms of the will of R. Bruce of Quebec and awarded annually on the basis of first-class standing to students entering second year. The award is renewable in third and fourth year providing satisfactory standing is maintained in the Faculty of Engineering and Applied Science. Two awards are available.

Eric R. Davis Memorial Award in Applied Science

Established by friends and family in memory of Eric Davis, B.Sc.(Eng) 1950, former member of the Board of Trustees of Queen's University. Awarded on the basis of standing on year's work to a student entering second, third or fourth year in any program in the Faculty of Engineering and Applied Science.

R.L. Dorrance Memorial Scholarship in Chemistry

Given by the Engineering Society for highest standing in first year Chemistry.

N.F. Dupuis Prize

Founded by Science graduates, for standing in Mathematics.

G.B. Dyer/DuPont Canada Scholarships

Established by DuPont Canada Inc. to recognize the significant contribution of Gerry B. Dyer, B.Sc.'52, D.Sc.'94, to the improvement and advancement of science education. Two scholarships will be awarded, one to a male and one to a female, who are Canadian or permanent residents and entering the second year of study in Chemical Engineering, Engineering Chemistry or Chemistry. Selection is based on high academic standing with consideration given to participation in the community or extra-curricular activities. In the case of students being equally eligible, financial need will be considered. Letters of application must be submitted by 15 April to the Heads of the Departments of Chemical Engineering or Chemistry who will then forward nominations by 1 May to their respective Scholarship Committee. **2 awards**

Lorne C. Elder Scholarship in Mechanical and Materials Engineering

Established by Lorne C. Elder, B.Sc. 1942, and awarded on the basis of academic excellence to students entering second, third or fourth year in the Department of Mechanical and Materials Engineering.

J.E. Hawley Memorial Scholarship in Geological Sciences and Geological Engineering

Established by Alban H. Norton, P.Eng. B.A. (Hons.) '36, in memory of J.E. Hawley, former Head of the Department of Geological Sciences. Awarded on the basis of academic excellence to a student registered in the second year of either the Geological Engineering program in the Faculty of Engineering and Applied Science or an Honours B.Sc. program in the Faculty of Arts and Science with a concentration in Geological Sciences. The candidate will be nominated by the Head of the Department of Geological Sciences and Geological Engineering.

H. Janzen Memorial Scholarship

Established in memory of H. Janzen who taught in the Department of Physics at Queen's until his death in 1988. Awarded annually to the student entering the second year of the Engineering Physics program who attained the highest standing in the first year physics courses in Engineering and Applied Science.

The Nellie and Ralph Jeffery Awards in Mathematics

Three or more scholarships are awarded, on the recommendation of the Department of Mathematics and Statistics, to undergraduate students majoring in Mathematics or Statistics. One of these shall be awarded to the student entering the fourth year of the Mathematics and Engineering program, or of an honours program with a Mathematics major, having the highest standing in the mathematics courses of the first three years and an overall first class average.

Annie Bentley Lillie Prizes in First Year Calculus

Founded in memory of the late Annie Bentley Lillie. A number of book prizes to be awarded each year on the recommendation of the Department of Mathematics and Statistics to students with high standing in any first year calculus courses.

Jacob Malomet Memorial Scholarship

Established by the family, friends and fellow-students of Jacob Daniel Malomet, who died in 1978 during his first year at Queen's. The award is presented annually to a first year Engineering and Applied Science student for general proficiency in term-length courses of the fall term.

Andrew McMahon Standards of Excellence Award

Established in memory of Andrew M. McMahon Sc. '59, a former president of the Engineering Society and member of the Board of Trustees. Awarded annually in Applied Science on the basis of excellent academic achievement to a first year student in the top ten percent of the class who is entering second year. The recipient should demonstrate strong interpersonal skills, with a commitment to excel in all aspects of university life, and high personal standards. The recipient will be chosen by a Selection Committee, to be chaired by a member of the family, consisting of the Director (Program Development), one member of the business community and a family member. Candidates should submit a letter of application with supporting documents to the Faculty of Engineering and Applied Science by 31 March.

A.J. McNab Scholarship

Given by Mr. A.J. McNab, this scholarship is awarded for standing in APSC 151, no failed courses. Open to students proceeding in Geological or Mining Engineering.

James L. Mason Cup

Established March 2010 in recognition of James L. Mason, an Associate Dean in the Faculty of Applied Science from 1996 to 2008, who has been instrumental in establishing the program in team-based, project-based learning in the First Year which is now an integral part of the Engineering and Applied Science curriculum. The cup recognizes Dr. Mason's outstanding leadership, education insight and administrative skill in developing and implementing the Program.

Criteria:

To be eligible the winning team in all of its project work, must function as an effective team with broad participation;

- Exhibit a high degree of technical competence;
- Demonstrate awareness of the economic, social, and environmental factors relevant to whatever they do;
- Communicate their work both in writing and oral presentation in such a way that the principles guiding their choices are clear to both technical and non-technical audiences.

Dr. William Moffat Prize

Founded by Dr. W. Moffat of Utica, N.Y., for second highest standing in APSC 131 and APSC 132.

William Wallace Near Scholarship

Established under terms of the will of W.W. Near of Toronto, for standing on year's work.

George and Mary Louise Patton Scholarship

Founded by G. Patton in memory of his wife and himself, for standing on year's work.

Ontario Professional Engineers Foundation for Education Scholarships

Awarded by the Ontario Professional Engineers Foundation for Education, on the recommendation of the University's Faculty of Engineering and Applied Science; undergraduate (in course) scholarships to be awarded based on a combination of high academic achievement and demonstrated leadership in professional affairs and extracurricular activities. Applications are submitted to the Faculty of Engineering and Applied Science for selection by the Engineering and Operations Committee (Scholarships). **2 awards in each of years 1, 2, 3**

Polycorp Ltd./Kumar Scholarship in Mining Engineering

Established in April 2007 by Polycorp Ltd. in recognition of Polycorp Ltd.'s Manager, Mining Products, Pramod Kumar, P.Eng. and in memory of his late father, Dr. Jiwan Lal Gupta. Awarded on the basis of academic excellence to a student entering second, third or fourth year of the Mining Engineering program in the Faculty of Engineering and Applied Science.

James H. Rattray Memorial Scholarships in Applied Science

Established by Major James H. Rattray, M.C. Several scholarships are awarded annually on the basis of academic merit to students entering the second, third and fourth years of programs in the Faculty of Engineering and Applied Science.

Carl Reinhardt Scholarship

To be awarded annually to a deserving student who enrolls in a second-year program leading to an honours B.Sc. degree with a concentration in Geological Sciences in the Faculty of Arts and Science, or who registers in the second year of the B.Sc. Geological Engineering program in the Faculty of Engineering and Applied Science.

Science 1941 Memorial Scholarship

Maintained by the class of Science '41 in memory of Mr. J.O. Watts, for standing on year's work.

Science 1945 Memorial Scholarship

Maintained by the Class of Science '45 as a memorial to members who gave their lives in World War II and awarded for standing on year's work. Two awards are available - one for standing on the first year's work and the other for standing on the second year's work.

Science 1946 Memorial Upper Year Scholarship

Maintained by the Class of Science '46 as a memorial to members who gave their lives in World War II and awarded on the basis of academic excellence to a student entering second or third year in the Faculty of Engineering and Applied Science.

Robert F. Segsworth Scholarship in Mining Engineering

Awarded at the beginning of the second year of the Mining Engineering program for general proficiency and renewable in the third and fourth years, provided satisfactory standing is maintained.

Raymond H. and Phyllis J. Smart Scholarships

Established in January 2010 by a bequest from the Estate of Phyllis J. Smart and awarded on the basis of academic excellence to students entering second, third or fourth year in the Faculty of Engineering and Applied Science. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

Stantec Award in Civil Engineering

Established in May 2006 by Stantec Consulting Ltd., and awarded to a full-time student entering the second or third year of the Civil Engineering program in the Faculty of Engineering and Applied Science on the basis of academic excellence and involvement in extracurricular activities specifically related to the Department, Faculty, or the University. Application must be submitted by letter to the Head of the Department of Civil Engineering by 31 March.

Ho Ming Tai Memorial Scholarship

Established by the family in memory of Ho Min Tai, Sci '83, who died tragically when Korean Air Lines Flight 007 was shot down on 1 September 1983. Awarded on the basis of standing in first year to an international student who is studying Electrical Engineering or Computer Engineering on a student authorization or a student visa and is subject to the payment of higher tuition fees. The scholarship will be renewed in the third and fourth years provided honours standing is maintained.

Adam Wallgren Memorial Award

Founded by Science '90 in memory of Adam Wallgren and awarded to a first year engineering student who through his/her kind actions and friendly disposition eased the rigors of day-to-day life in first year. Written nominations should be submitted to the Engineering Society no later than 15 February. The recipient shall be selected by the Engineering Society Awards Committee, in consultation with the Dean, and awarded at the Engineering Society's Annual Retreat.

George Thomas Warren Scholarship in Computer Engineering

Established in October 2000 by Mrs. Evelyn Warren, in memory of her husband, George Thomas Warren, B.Sc. (Eng.) 1938. Awarded on the basis of academic excellence to full-time students entering second year of the Computer Engineering program in the Faculty of Engineering and Applied Science.

Morley E. Wilson Scholarship in Geological Sciences and Geological Engineering

Established by a bequest from the estate of Morley E. Wilson, and awarded on the basis of standing at the end of the first year to a student entering the second year of a B.Sc. program in Geological Engineering or an Honours B.Sc. program with a concentration in Geological Sciences. The award is in two parts, one-half on entrance to the second year program and one-half on entrance to the third year program, provided that the student maintains an average of at least 75 percent.

Second Year Awards

American Society for Metals Scholarship in Mechanical Engineering (Kingston Chapter)

Established by The Kingston Chapter of the American Society for Metals to provide an annual scholarship to a full-time student entering the third year of the Materials Option in the Mechanical Engineering program in the Faculty of Engineering and Applied Science. Awarded to the student with the highest cumulative average.

Manley B. Baker Scholarships in Geology

Founded by Agnes Moreland Baker. Two scholarships awarded annually to the students in the Faculty of Arts and Science or Engineering and Applied Science, obtaining the highest and second highest standing in the geology courses of the first and second years of their respective programs. These scholarships are open only to students taking a program leading to an honours B.Sc. degree with a concentration in Geological Sciences in Arts and Science or to a B.Sc. in Geological Engineering in Engineering and Applied Science.

Donovan Brown Scholarship in Applied Science

Established in May 2006 by Alice J. Brown in memory of her husband, Donovan Brown, B.Sc. (Engineering Chemistry) 1949, and awarded on the basis of academic excellence to student(s) entering the third or fourth year of any Engineering program in the Faculty of Engineering and Applied Science. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

Orville and Carmel Brown Scholarship

Established by Orville and Carmel Brown and awarded to a student in any year of the Engineering Physics program on the basis of academic excellence. The recipient must be a Canadian citizen or landed immigrant, and if possible, a resident of Lennox and Addington, Frontenac or Leeds and Grenville counties. Selection will be made by the Engineering Physics Department.

Dr. Erwin Buncel Scholarship in Chemistry

Established in September 2008 by the family of Dr. Erwin Buncel, a distinguished professor of organic chemistry in the Department of Chemistry since 1962, in memory of Ignacz, Irena and Marta Buncel. Awarded to a student in an Honours Chemistry or Environmental Chemistry program (Faculty of Arts and Science), or Engineering Chemistry program (Faculty of Engineering and Applied Science), entering third year with the highest combined average standing in either CHEM 222 and CHEM 223 (Arts and Science), or ENCH 222 and ENCH 245.

Cameron Applied Science Scholarship

Established in February 2006 by Hugh Cameron, B.Sc. 1973, and Heather Hume, B.A. 1972, M.D. 1978, to provide an award on the basis of academic excellence to students entering third or fourth year of any program in the Faculty of Engineering and Applied Science who has applied their engineering knowledge and/or techniques in an innovative manner related to non-traditional engineering fields. Nominations may be made by faculty members or students should apply by letter, with attached resume, to the Faculty of Engineering and Applied Science by 1 October.

Harold M. Cave Undergraduate Travel Scholarship

Established in June 2014 by the estate of Harold M. Cave, B.A. 1925, M.A. 1926 and awarded on the basis of academic excellence to students in any undergraduate year of an honours degree in Physics or Astronomy in the Faculty of Arts and Science or an honours degree in Engineering Physics in the Faculty of

Engineering and Applied Science. Awarded to students for the purpose of attending the Canadian Undergraduate Physics Conference or other equivalent conference. Funds are to be used to cover conference fees and travel related expenses. Selection will be made by the Scholarship Committee of the Department of Physics, Engineering Physics & Astronomy. Applicants are to submit a letter of application to the Department of Physics, Engineering Physics & Astronomy by 30 September.

ConeTec Geotechnical Award

Established in October 2012 by ConeTec Investigations Ltd. and awarded to students registered in second or third year in any undergraduate academic plan in Civil Engineering, Mining Engineering and/or Geological Engineering in the Faculty of Engineering and Applied Science. The student recipient must have demonstrated leadership, curiosity and independent thinking, and have indicated a desire and suitability to pursue fieldwork and field-based research. A letter of application, along with a one to two page submission outlining their interests and engagement in geotechnical engineering, for example, through courses taken, co-curricular activities, and/or summer employment, is to be submitted to the Faculty of Engineering and Applied Science by 1 February for selection by the Operations Committee (Scholarships). Recipients will also be invited to apply for a paid summer internship experience for a period of 12-16 weeks at one of ConeTec's North American field operations; acceptance of employment is not a condition of this award.

ConeTec Geotechnical Award in Mining Engineering

Established in October 2014 by ConeTec Investigations Ltd. and awarded on the basis of academic achievement to undergraduate students in second or third year of the undergraduate program in Mining Engineering in the Faculty of Engineering and Applied Science. The student recipient must have demonstrated leadership, curiosity and independent thinking, and have indicated a desire and suitability to pursue fieldwork and field based research. A letter of application, along with a one to two page submission outlining their interests and engagement in geotechnical engineering through courses taken, co-curricular activities and/or summer employment, is to be submitted to the Faculty of Engineering and Applied Science by 1 February for selection by the Operations Committee (Scholarships). Recipients will also be invited to apply for a paid summer internship experience for a period of 12-16 weeks at one of ConeTec's North American field operations; acceptance of employment is not a condition of this award.

Engineering Chemistry Industrial Scholarship

Established in February 2010 to recognize the industrial practice of engineering chemistry, as embodied by the DuPont Industrial Research Chair held by Dr. Warren Baker from 1985-1995 in the Department of Chemistry at Queen's. Awarded to a student entering third year of the Engineering Chemistry program in the Faculty of Engineering and Applied Science on the basis of academic excellence in the second year of the Engineering Chemistry program, who does not hold a scholarship of greater value from Queen's University. Selection will be made by the Operations Committee (Scholarships) of Engineering and Applied Science on the recommendation of the Head and Chair of Undergraduate Studies in the Department of Chemical Engineering.

Isaac Cohen Scholarship

Given by Mr. Isaac Cohen for standing on year's work. Open to candidates in Civil Engineering.

H. Arnold Cowan Scholarship

Established in December 2005 from the estate of Ellen Harcourt Boyd in memory of her husband H. Arnold Cowan. Awarded on the basis of academic excellence to students entering the third or fourth year of any

Engineering program in the Faculty of Engineering and Applied Science. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

Eric R. Davis Memorial Award in Applied Science

Details of this award are given in the section on *First Year Awards*.

Parsons Inc. Scholarship (formally named the Delcan Corporation Scholarship in Applied Science)

Established in October 2006 by Parker & Associates Inc. and awarded on the basis of academic excellence, demonstrated initiative and leadership, to students entering the third or fourth year of studies in the Faculty of Engineering and Applied Science. Students in second or third year of studies submit their applications to the respective Head of their Department by 31 March. Selection will be made by Faculty of Engineering and Applied Science Operations Committee (Scholarships).

J.J. Denny Memorial Scholarship

Founded by Mrs. J.J. Denny and by the Classes of '03-'06 and other friends of James Denny, M.Sc.'21, for standing on year's work. On the recommendation of the Department of Mining Engineering, two awards are made, one in the 'mining option' and the other in the 'mineral processing option', with preference given to students in their second year.

J.J. Denny Memorial Scholarship in Geological Engineering

Established from the sale of gold nuggets donated by Mrs. J.J. Denny in memory of James Denny, M.Sc. '21, and awarded on the basis of academic performance in the second year to two students entering the third year of a program in Geological Engineering. The scholarships are awarded on the recommendation of the department and students entering fourth year may be chosen if there are no suitable candidates entering third year.

Charles W. Drury Scholarship

The will of C.W. Drury, B.Sc. 1909, provides for this scholarship. Open to students entering third or fourth year of the Materials Option in Mechanical Engineering. Awarded on the recommendation of the Department of Mechanical and Materials Engineering mainly for academic excellence but consideration will be given for evidence of additional traits desirable in a professional engineer.

Lorne C. Elder Scholarship in Mechanical and Materials Engineering

Details of these awards are given in the section on *First Year Awards*.

Endeavour Silver Corp. Scholarship

Established in January 2012 by Endeavour Silver Corp. and awarded on the basis of academic excellence to students entering third or fourth year in the Geological Sciences program in the Faculty of Arts and Science, or the Geological Engineering program in the Faculty of Engineering and Applied Science. Selection will be made by the Undergraduate Scholarship Committee in the Department of Geological Sciences and Geological Engineering.

Engineering Society Prize

Given by the Engineering Society to the student in second year Engineering who has exhibited the most ability in non-athletic extracurricular leadership and activity. Recipient is chosen in consultation with the Engineering Society Awards Committee.

Fluor Canada Ltd. Scholarship

Established in September 2009 by Fluor Canada Ltd. Awarded on the basis of academic excellence to full-time students who are Canadian citizens or permanent residents entering the third or fourth year of the Chemical Engineering, Electrical and Computer Engineering, Mechanical or Civil Engineering program in the Faculty of Engineering and Applied Science.

Les Gulko Award

Awarded on the recommendation of the Department of Mathematics and Statistics to a student entering the third year of the Mathematics and Engineering program, based on academic performance in the second year. At the discretion of the Department, the award may be divided equally between two qualified candidates.

J.C. Gwillim Prize

Awarded for standing on year's work to candidates in Mining Engineering.

Robert Hall Memorial Award

Founded by the class of Science '86 and the Queen's Mining Club in memory of Robert Hall, a member of Science '86. Awarded on the basis of interest in the Engineering Society, participation in intramural or intercollegiate sports and the demonstration of those qualities exemplified by Robert Hall: spirit, fellowship and enthusiasm. The recipient will have passed all the courses of the First Year and maintained a full academic program in the second year. Selection is by the Engineering Society from nominations made by the engineering student body. A replica of the commemorative plaque will be presented annually in March with the award.

Mike Hamze Memorial Scholarship

Established in March 2002 by friends, family and co-workers in memory of Mike Hamze, B.Sc. 1997 (Eng.). Awarded to a student entering the third or fourth year in the Civil Engineering program in the Faculty of Applied Science based on academic merit and community involvement. Applicants should submit a letter of application, along with a resume, to the Head of the Department of Civil Engineering by 31 March.

James Hickey Memorial Prize

Established by Mr. and Mrs. J.W. Hickey, Marmora, Ontario, in memory of their son, James Hickey, for standing in MECH 213.

Lawrence M. Hunter Memorial Award

Established by John L. Hunter, B.Sc. 1969, in memory of his father, Lawrence M. Hunter, B.Sc. 1936 and awarded to a student entering the third or fourth year of studies in the Faculty of Applied Science, who has made outstanding humanitarian contributions as evidenced through volunteer activities both within and outside of the university environment while maintaining satisfactory academic achievement. Preference will be given to candidates who have not received other University awards of higher value. This award may be received only once by an individual. Students in second year or third year of studies submit their application by letter, accompanied by a resume and two letters of reference, one of which must be from an individual who can attest to the student's humanitarian efforts and submitted to the Faculty of Engineering and Applied Science by 31 March.

Ingenium Group/Joe Dominik Scholarship

Established in May 2005 by the Ingenium Group in memory of Joe Dominik, a Queen's alumnus and local Kingston Architect. Awarded on the basis of academic excellence to a full-time student entering the third year of study in the Department of Electrical and Computer Engineering in the Faculty of Engineering and Applied Science.

Nellie and Ralph Jeffery Awards in Mathematics

Details of these awards are given in the section on *Third Year Awards*.

Shirley C. Kennedy Scholarship in Civil Engineering

Established in November 2006 memory of Shirley C. Kennedy, Arts 1940, and awarded on the basis of academic excellence to a full-time undergraduate or graduate student in the Department of Civil Engineering. Selection will be made by the Departmental Awards Committee.

KGHM International Ltd. Scholarship

Established in March 2012 by KGHM International Ltd. and awarded on the basis of academic excellence and proven leadership skills, to undergraduate students registered in the Geological Engineering program or the Mining Engineering program in the Faculty of Engineering and Applied Science. A letter of application outlining interest and engagement in the mining industry, as well as a resume is to be submitted to the Office of the University Registrar, Student Awards, by 1 March. Selection will be made by a Committee comprised of faculty members from the Department of Geological Sciences and Geological Engineering and the Robert M. Buchan Department of Mining.

Cyril W. Knight Scholarship

A bequest by Douglas G.H. Wright, awarded to student who attains the highest Grade Point Average in all science and engineering courses in both first and second years of the program.

Kostuik Scholarship in Mining Engineering

Established by Anne and John Kostuik, B.Sc. Eng. '34, and awarded on the basis of academic standing to one student entering the third year and one student entering the final year of the Mining Engineering program.

Frank B. Lee Memorial Scholarship in Engineering

Established by friends and family in memory of Frank B. Lee, B.Sc. 1945. Awarded on the basis of high academic standing to a student entering the third year of any engineering program in the Faculty of Engineering and Applied Science.

Ian Joseph MacDonald Scholarship in Mechanical Engineering

Founded in memory of Dr. Ian J. MacDonald, Sc. '54, awarded to the Mechanical Engineering student completing second year with the highest aggregate mark in the courses in Statics, Kinematics, Dynamics, and Solid Mechanics.

Clifton Campbell MacKinnon and Barbara Claire Adsit MacKinnon Prize in Mechanical Engineering

Established by the family of the late C.C. MacKinnon, Science '36. Awarded to the second year Mechanical Engineering student with the highest standing on the year's work.

Alexander Macphail Scholarship

Maintained by the Class of Science '14, for standing on year's work.

Michele Mainland Memorial Scholarship in Chemical Engineering

Established in memory of Michele Mainland, B.Sc. '97, by family, friends and fellow students to honour Michele's love of learning and education. Two awards are given annually to students in second and third year Chemical Engineering with the highest overall standing on year's work.

Roberta McCulloch Prize in English

Founded by the late Andrew McCulloch of Thorold. Awarded to the student in second, third or fourth year Engineering and Applied Science who achieves the highest standing in an English course.

McLean Family Award in Student Design

Established in March 2007 by the McLean family in honour of Kenneth Mclean, B.S.c (Eng. Phys.) 2005, in appreciation for the valuable team experiences and life lessons learned from his active participation with the Queen's Solar Vehicle Team from 2001 to 2005. Awarded to an upper year student in the Faculty of Engineering and Applied Science who has a cumulative average of at least 65% and who is actively involved on a student design team, with preference to students who are members of the Solar Vehicle Team. Preference will be given to students whose address on admission to Queen's was from outside the province of Ontario. Application is by letter, along with a written endorsement by a design team faculty member, to the Faculty of Engineering and Applied Science by 31 March. The recipient shall be selected by the Engineering and Applied Science Operations Committee (Scholarships).

Mining 1988 Scholarship

Awarded, on the recommendation of the Head of the Robert M. Buchan Department of Mining, to a student entering third or fourth year of the Mining Engineering academic plan in the Faculty of Engineering and Applied Science who demonstrates good character and strong industry leadership potential, a keen interest and aptitude for his or her studies in mining engineering and the desire and ambition to truly make a

difference in the global metals and minerals industry. Consideration will also be given for the candidate's involvement in extracurricular activities at Queen's, school spirit and impact on class camaraderie.

Modular Mining Systems Scholarships

Established in April 2012 by Modular Mining Systems and awarded on the basis of academic excellence to an undergraduate student entering second or third year in the Mining Engineering Option of the Mining Program in the Faculty of Engineering and Applied Science, and to an undergraduate student entering second or third year in the Mining-Mechanical Option of the Mining Program in the Faculty of Engineering and Applied Science. Selection will be made by the Faculty of Engineering and Applied Science Operations Committee (Scholarships). Two awards available.

R.T. Mohan Undergraduate Scholarship in Chemistry

Awarded to a promising student entering the third or fourth year of the Engineering Chemistry program in the Faculty of Engineering and Applied Science or the Honours Chemistry program in the Faculty of Arts and Science, provided that the recipient has first class standing. At the discretion of the Department, the scholarship may be divided equally between two qualified candidates. A Mohan Scholar may be eligible for renewal of the award once only in competition with other qualified candidates.

Mowat Prize

Founded by John McDonald Mowat for standing on year's work.

Frank S. Pichler Memorial Scholarship

Established in April 2012 by Sherly Pichler in memory of her husband Frank S. Pichler, B.Sc. (Eng) 1983. Awarded on the basis of academic excellence to students entering third or fourth year in the Robert M. Buchan Department of Mining. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

William Wallace Near Scholarship

Established under the terms of the will of W.W. Near of Toronto, for standing on year's work.

Emil Nenniger International Exchange Scholarship in Chemical Engineering

Established in 2004 by Dr. Emil Nenniger, B.Sc. '50 and awarded on the basis of academic excellence to a student entering third year in the Department of Chemical Engineering or Engineering Chemistry in the Faculty of Engineering and Applied Science, who has been selected to participate in an official exchange program at a location outside Canada. Letters of application must be submitted to the Head of Chemical Engineering by 1 March. Selection will be made by the Departmental Scholarships Committee.

Dr. William H. Nichols Prize in Chemistry

Founded by Mr. C.W. Nichols in memory of his father, Dr. William H. Nichols. Awarded annually to a student in the Faculty of Engineering and Applied Science or in the Faculty of Arts and Science who has attained the highest standing in CHEM 213.

Northeastern Chemical Association Scholarship

Established by Northeastern Chemical Association, Inc. and awarded to a full-time undergraduate student enrolled in Chemical Engineering, Engineering Chemistry or Chemistry on the basis of academic performance and interest in science issues. Students must submit a letter of application outlining goals, interests, career objectives and experience to the Head of their Department by 15 March, who will then forward nominations by 1 April to their respective Scholarship Committee.

Novelis Scholarship

Established in April 2006 by Novelis Inc. Two scholarships will be granted to students in the penultimate or final year on the basis of academic excellence. One scholarship will alternate between the School of Business and the Faculty of Arts and Science (Chemistry, Economics, Geological Sciences or Physics). The scholarship will be awarded to a student in the Faculty of Arts and Science in even numbered years and to a student in the Bachelor of Commerce program in odd numbered years. **One scholarship will be awarded to a student in any program of Engineering in the Faculty of Engineering and Applied Science.** Preference will be given to children of Novelis employees who have applied by letter to the Associate University Registrar (Student Awards) by 1 March. If there are no eligible children of Novelis employees, the selection will be made by the Awards Committee of the faculties.

O'Connor Associates Scholarship in Geological Engineering

Established by O'Connor Associates Environmental Inc. and awarded to a student entering the third year of the Geological Engineering program, Geo-environmental Option. Selection will be based on a strong academic record, a keen interest in environmental issues, and participation in student activities. The scholarship recipient will be selected by the Geo-environmental Engineering Steering Committee, in consultation with second year instructors. If there is no suitable candidate entering third year, the scholarship may be awarded to a student entering fourth year.

Ontario Power Generation Award

Established by Ontario Power Generation and awarded to a student who at the time of application is registered in second year in any program in the Faculty of Engineering and Applied Science. The recipient must be a Canadian citizen or a landed immigrant to be eligible. Selection will be based on academic achievement, strong oral and written communication skills, leadership ability and involvement in extra-curricular activities. The recipient must be a member of the employment equity target groups (women, aboriginal, disabled, visible minority) and cannot hold more than one other award of equal or greater approximate value. Candidates should submit a letter of application to the Head of Departments by 31 January and selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

Ontario Professional Engineers Foundation for Education Scholarships

Details of this award are given in the section on *First Year Awards*.

David Parkes Scholarship in Applied Science

Established by David Parkes, B.Sc. 1968, and awarded on the basis of academic excellence to a full-time upper year student in the Faculty of Engineering and Applied Science.

Polycorp Ltd./Kumar Scholarship in Mining Engineering

Details of this award are given in the section on First Year Awards.

Queen's C.A.P. Prize Examination Award

Established in April 2008 by the Department of Physics, Engineering Physics and Astronomy, and awarded annually to students based on their academic performance in the nationwide Canadian Association of Physicists University Prize Examination. Awarded to first and second ranked students in each of second, third, and fourth year of undergraduate studies in the Department of Physics, Engineering Physics and Astronomy. Selection of award recipients will be based on the recommendation of the Department of Physics, Engineering Physics and Astronomy.

QUIP International Tuition Award

Established in November 2007 by the Faculty of Engineering and Applied Science and awarded on the basis of academic achievement to international students participating in the Queen's University Internship Program (QUIP).

James H. Rattray Memorial Scholarships in Applied Science

Details of this award are given in the section on *First Year Awards*.

Alvin Craig Ross Memorial Scholarships in Mineral Processing

Established in memory of Alvin Craig Ross by his father, Mr. A.H. Ross, B.Sc.(Eng.)'36. One scholarship is awarded annually on the completion of the second year and one on the completion of the third year, to candidates enrolled in Mining Engineering, who are Canadian citizens resident in Canada who have demonstrated an interest in the field of extractive metallurgy and have expressed an intention of making a career in the mining industry in Canada. Selection is based on academic standing, character, personal initiative and industry, and reliability. Financial need will only be considered if two applicants exist with comparable other qualifications. Candidates will be recommended to the Engineering and Applied Science Operations Committee by a committee composed of the Dean of Engineering and Applied Science and Head of the Mining Engineering, by 1 May.

Science 1911 Prize

Awarded for standing on year's work.

Science 1922 Scholarship

Maintained by the Class of Science '22, for standing on year's work.

Science 1945 Memorial Scholarship

Details of this award are given in the section on *First Year Awards*.

Science 1946 Memorial Upper Year Scholarship

The Science 1946 Memorial Upper Year Scholarship is maintained by the Class of Science '46 as a memorial to members who gave their lives in World War II. Awarded on the basis of academic excellence to a student entering second or third year in the Faculty of Engineering and Applied Science.

Science 1948 S.N. Graham Award

Founded by the class of Science '48 in honour of Professor S.N. Graham. Awarded on the completion of the second year to a student with a sound academic record who has demonstrated outstanding performance in extra-curricular activities on campus. Nominations are to be made by Heads of Departments by 31 March, who will then forward their nomination to the the Faculty of Engineering and Applied Science for selection by the Operations Committee (Scholarships).

A.E. Segsworth Prize

Founded by R.F. Segsworth of Toronto in memory of his brother. Open to a student in any year on the basis of the best essay describing his or her experiences in practical underground mining. Essays to be submitted by 31 March to the Robert Buchan Department of Mining.

Raymond H. and Phyllis J. Smart Scholarships

Details of this award are given in the section on *First Year Awards*.

Carolyn F. Small Memorial Award for Design Innovation

Awarded on the basis of demonstrated outstanding creativity in the practice of engineering design to an individual or a group of students at Queen's University who are directly involved with academic or sponsored extracurricular design efforts associated with or funded by the Faculty of Engineering and Applied Science.

Robert E. Smith Memorial Scholarship in Mining Engineering

Established by the family and friends of Robert Evan Smith, a Queen's Mining Engineer, who died in a tragic mining accident shortly after graduation in 1984. Awarded to a full-time Canadian student entering the third or fourth year. The recipient will be one who conscientiously contributes to all aspects of university life, while maintaining good academic standing and who exhibits cheerful enthusiasm and a positive attitude towards the Mining Engineering program and the mining industry in general. Financial need will also be taken into consideration, as will the recipient's personality and compassion towards fellow students. Selection will be made by the Head of the Department of Mining Engineering in consultation with appropriate instructors.

Stantec Award in Civil Engineering

Details of this award are given in the section on *First Year Awards*.

Alice Pierce Waddington Scholarship

Open to students in Civil Engineering specializing in building construction. Awarded on scholastic ability and attainment, integrity of character and purpose.

William E. White Scholarships in Geological Sciences and Geological Engineering

Established by a bequest from the estate of William E. White, B.A. (1929), B.A. (Hons) 1930, and Medalist in Geology. Awarded to students in the second year, or students entering third or fourth year of a program leading to B.Sc. degree with a concentration in Geological Sciences in the Faculty of Arts and Science or a B.Sc. degree in Geological Engineering in the Faculty of Engineering and Applied Science. Awards are based on academic achievement and contribution to the Department as judged by the Head of the Department in consultation with the Department's teaching staff. **Awards to second-year students are made in January** based on performance in GEOL 211 or 221 and GEOL 232. **Awards to third-and fourth-year students are made in the Spring.**

W.P. Wilgar Memorial Scholarship

Maintained by the classes of Science '03-'06 and other friends of W.P. Wilgar, B.Sc. '03, for standing on year's work.

Marion and Arthur Wonnacott Scholarship

Established in September 2008 from the estate of Marion Wonnacott and Arthur Wonnacott, B.A. 1934. **Two awards will be made each year**, one to a student in Arts and Science who achieves the highest combined average in MATH 280 and 281 taken in the same year and one to the student in Engineering and Applied Science who achieves the highest combined average in MTHE 280 and MTHE 281.

Third Year Awards

Joseph Abramsky Prize

Founded in memory of Joseph Abramsky by his sons, for standing on year's work. Open to candidates in Mechanical Engineering.

Accenture in Applied Science Scholarship

Established in May 2002 by Accenture Inc. and awarded to a student entering fourth year in the Faculty of Applied Science. Selection will be made on the basis of academic excellence and leadership in extracurricular activities, such as professional or social organizations, sports, or part-time employment. Preference will be given to students who have had exposure to a consulting business or initiative in the past. Application is by letter with attached resume to the Faculty of Engineering and Applied Science by 31 March for selection by the Operations Committee (Scholarships).

Frederick and Christopher Ansley Scholarship

Established by Peter Ansley's family in honour of his father Frederick C. Ansley, B.Sc. (Eng.) 1937 and brother Christopher Ansley, B.Sc (Eng.) 1969, and awarded to a student entering the fourth year of the Civil Engineering program. Selection will be based on academic excellence and contribution to the betterment of campus life through interest in the student chapters of the profession, Engineering Society, campus activities and community affairs. Applications and nominations should be submitted to the Head of the Department of Civil Engineering by 1 March. Selection will be made by the Departmental Awards Committee.

Leonard G. Berry Memorial Award

Established by the family, colleagues, friends and former students of the late Professor Leonard G. Berry, professor of mineralogy at Queen's University from 1944 to 1980, as a tribute to his outstanding contributions to mineralogical science and his devotion as a teacher. Awarded, on the recommendation of the Department of Geological Sciences and Geological Engineering, to a senior undergraduate student with a strong academic record and a demonstrated interest in mineralogy. To be eligible, the student must be enrolled in an honours B.Sc. program with a concentration in Geological Sciences in the Faculty of Arts and Science, or in Geological Engineering in the Faculty of Engineering and Applied Science.

Donovan Brown Scholarship in Applied Science

Details of this award are given in the section on *Second Year Awards*.

Orville and Carmel Brown Scholarship

Details of this award are given in the section on *Second Year Awards*.

Erwin Buncel Scholarship in Chemistry

Details of this award are given in the section on *Second Year Awards*.

Cameron Applied Science Scholarship

Details of this award are given in the section on *Second Year Awards*.

Kenneth B. Carruthers Scholarship in Mechanical Engineering

Founded in memory of Major K.B. Carruthers, B.Sc., for standing on year's work. Open to candidates in Mechanical Engineering, Materials option.

Kenneth B. Carruthers Scholarship in Mining Engineering

Founded in memory of Major K.B. Carruthers, B.Sc., for standing on year's work. Open to candidates in Mining Engineering.

Harold M. Cave Scholarship in Experimental Physics

Established in memory of Harold M. Cave, M.A. (Queen's), Ph.D. (Cantab), who taught in the Physics Department from 1930 until years after his retirement in 1967. Two scholarships are awarded annually to students with first class standing, one entering the third year leading to a B.Sc. degree in Engineering Physics and one entering the third year of a B.Sc. (Honours) program in Arts and Science with a concentration in Physics. The awards will be based on achievement in experimental work as judged by the Department of Physics.

Harold M. Cave Undergraduate Travel Scholarship

Details of this award are given in the section on *Second Year Awards*.

CMC Electronics Scholarship

Established by the Canadian Marconi Company, this scholarship is awarded annually to a student with high academic standing in the third year of an Electrical or Computer Engineering program in the Faculty of Engineering and Applied Science.

Harold Arthur Cohen Book Prize in Engineering Physics

Established by the family in memory of Harold Arthur Cohen, B.A. 1928, B.Sc. 1930 (Engineering Physics). Awarded to a student entering the fourth year of Engineering Physics who shows the most promise for inventiveness and discovery in Engineering Physics, as determined by the Chair of the Engineering Physics program.

ConeTec Geotechnical Award

Details of this award are given in the section on *Second Year Awards*.

ConeTec Geotechnical Award in Mining Engineering

Details of this award are given in the section on *Second Year Awards*.

H. Arnold Cowan Scholarship

Details of this award are given in the section on *Second Year Awards*.

Eric R. Davis Memorial Award in Applied Science

Details of this award are given in the section on *First Year Awards*.

Delcan Corporation Scholarship in Applied Science

Details of this award are given in the section on *Second Year Awards*.

John Deere Foundation of Canada Scholarship in Mechanical Engineering and Commerce

Established by the John Deere Foundation of Canada and awarded on the basis of academic merit to a student entering the final year of the Mechanical Engineering program in the Faculty of Engineering and Applied Science or to a student entering the final year of the Commerce program in the School of Business. The award will be presented to a student in Mechanical Engineering in even-numbered years and to a student in Commerce in odd-numbered years.

J. Allan Donaldson Prize in Geology

Established by J. Allan Donaldson, B.Sc. 1956, and awarded to a student entering the fourth year in either an Honours B.Sc. program in the Faculty of Arts and Science with a concentration in Geological Sciences or in the Geological Engineering program in the Faculty of Applied Science. If there are no eligible recipients the award can be given to a student entering third year. The recipient of the award will have demonstrated

an involvement and ongoing interest in the broad area of Precambrian geology, as demonstrated by coursework and/or summer field employment. The recipient will be chosen by the Head of the Department of Geological Sciences and Geological Engineering, in consultation with the Chairs of Arts and Science for Geology and Engineering and Applied Science for Geological Engineering.

Drilling and Blasting Scholarship

Established in October 2012 by Jamie Archibald and the Rock Mechanics Group of the Robert M. Buchan Department of Mining to honour those in the mining industry who strive to augment explosives technology training and enhance the safety of all who participate in explosives applications within this industry. Awarded on the basis of academic excellence in MINE 321 (Drilling and Blasting) to students entering year four in the Mining Engineering program in the Robert M. Buchan Department of Mining. Selection will be made by the Faculty of Engineering and Applied Science Operations Committee (Scholarships).

Charles W. Drury Scholarship

The will of C.W. Drury, B.Sc. (Queen's)'09, provides for this scholarship. Open to students entering third or fourth year of the Materials Option in Mechanical Engineering. Awarded on recommendation of the Department of Mechanical and Materials Engineering mainly for academic excellence but consideration will be given for evidence of additional traits desirable in a professional engineer.

Endeavour Silver Corp. Scholarship

Details of this award are given in the section on *Second Year Awards*

Engineering Physics Award

Awarded to a student, with at least second class standing, entering preferably the third or alternatively the fourth year of the Engineering Physics program whose total awards, administered by Queen's University, will not exceed twice the tuition fees for Canadian residents. The award is restricted to women until such time as 50 percent of the students registered in Engineering Physics are women. Applications should be made by 31 March to the advisor of Engineering Physics, who will make the nomination on behalf of the Department.

Expo 1986 Award

Established to commemorate the 1986 International Exposition held in Vancouver, and the Innovative Vehicle Design Competition held during the exposition, in which the team from Queen's University received fourth prize. Awarded on the recommendation of the Dean in consultation with the Engineering Society to a student entering the final year of a program in Mechanical Engineering, Electrical Engineering or Computer Engineering. Selection will be on the basis of academic standing, a demonstrated ability in innovative engineering design, and participation in extra-curricular activities. Applications must be submitted to the Faculty of Engineering and Applied Science for selection by the Operations Committee (Scholarships) by 31 March.

Fifth Field Company Prize

Provided from funds accumulated by members of the unit since World War I. Awarded to student in Civil Engineering standing highest in third year course in hydraulics.

Fluor Canada Ltd. Scholarship

Details of this award are given in the section on *Second Year Awards*.

J. Nelson Gibson, B.Sc., Memorial

Awarded by Department of Mechanical Engineering to student entering fourth year Mechanical Engineering; consideration given to academic status and need.

Mike Hamze Memorial Scholarship

Established in March 2002 by friends, family and co-workers in memory of Mike Hamze, B.Sc. 1997 (Eng.) Awarded to a student entering the third or fourth year in the Civil Engineering program in the Faculty of Engineering and Applied Science based on academic merit and community involvement. Applicants should submit a letter of application, along with a resume, to the Head of the Department of Civil Engineering by 31 March.

Wm. Roy Hardick Scholarship

Established through the estate of Mr. Wm. Roy Hardick, B.A. 1933, M.A. 1934. Two scholarships are awarded on the basis of academic excellence: one scholarship to an undergraduate student entering fourth year in the Faculty of Arts and Science with a concentration in Mathematics and Statistics and one scholarship to an undergraduate student entering fourth year in the Faculty of Engineering and Applied Science in the Mathematics and Engineering program.

Lawrence M. Hunter Memorial Award

Details of this award are given in the section on *Second Year Awards*.

Nellie and Ralph Jeffery Awards in Mathematics

Details of this award are given in the section on *Second Year Awards*.

Shirley C. Kennedy Scholarship in Civil Engineering

Details of this award are given in the section on *Second Year Awards*.

KGHM International Ltd. Scholarship

Details of this award are given in the section on *Second Year Awards*.

The Kostuik Scholarship in Mining Engineering

Details of this award are given in the section on *Second Year Awards*.

Mark Latham Memorial Award

Established by the family and friends in memory of Mark Latham (B.Sc. '83), a Queen's Engineering Chemist. The purpose of this award is to recognize a student with personal characteristics similar to those of Mark Latham. The purpose of this award is to recognize students with personal characteristics similar to those Mark Latham. It will be awarded to students in good academic standing entering the fourth year of the Faculty of Engineering and Applied Science. The recipients will be well rounded students combining enthusiasm and leadership with integrity and a sense of humour. Candidates for this award will have made significant contributions to Queen's and the community. Selection shall be made by the Operations Committee (Scholarships) of Engineering and Applied Science based on nominations provided by the Engineering Society.

Reuben Wells Leonard Penultimate Scholarships

Given by Reuben Wells Leonard for standing on year's work in any program in engineering. A minimum average of 80 percent is required.

Michele Mainland Memorial Scholarship in Chemical Engineering

Details of this scholarship are given in the section on *Second Year Awards*.

Kogi Lon Mayell Memorial Scholarship

Established in memory of Kogi Lon Mayell, B.Sc.'91, by his family and friends and awarded on the basis of academic performance to a student entering the final year of the Mechanical Engineering program. The recipient should also be involved in student affairs, sports, and other extracurricular activities and show a willingness to assist fellow students. The selection of the candidate will be made by the Head of Mechanical Engineering in consultation with members of the Department.

Roberta McCulloch Prize in English

Details of this scholarship are given in the section on *Second Year Awards*.

McLean Family Award in Student Design

Details of this award are given in the section on *Second Year Awards*.

Edward Hugh McLellan Memorial Scholarship in Soil Mechanics

Established in memory of Edward Hugh McLellan, Sc.'80. Awarded annually to the Civil Engineering student with the highest standing in CIVL 340.

Andrew McMahon Standards of Excellence Award

Established in memory of Andrew M. McMahon Sc. '59, a former president of the Engineering Society and member of the Board of Trustees. Awarded annually in Engineering and Applied Science on the basis of academic achievement to a third year student in the top 25% of the class who is entering fourth year. Preference will be given to students who have demonstrated an interest in business studies or economics. The recipient will show a strong record of participation in student organizations and government, extra curricular and community activities and interest in promoting the well-being of the University. The recipient will be chosen by a Selection Committee, to be chaired by a member of the family, consisting of the

Associate Dean (Academic), one member of the business community and a family member. Candidates should submit a letter of application and supporting documents to the Faculty of Engineering and Applied Science by 31 March.

Mining Engineering Scholarship

Established in May 2007 by Bill James, LL.D 1990, and awarded on the basis of academic excellence and demonstrated leadership qualities to a student entering the fourth year of the Mining Engineering program in the Faculty of Engineering and Applied Science. Students should apply by letter, with a resume, to the Buchan Department of Mining by 31 March.

Mining 1988 Scholarship

Details of this award are given in the section on *Second Year Awards*.

R.T. Mohan Undergraduate Scholarship in Chemistry

Details of this award are given in the section on *Second Year Awards*.

Modular Mining Systems Scholarships

Details of this award are given in the section on *Second Year Awards*.

Susan Near Scholarships

Established under terms of the will of Susan Near of Toronto, for standing on year's work. (5 available)

Susan Near Prizes in Chemistry

Founded by the late Susan Near of Toronto. Two prizes to be awarded, one to the student in Arts and Science with the highest standing in CHEM 397, and one to the student in Applied Science with the highest standing in CHEM 398 or CHEM 399, provided the mark obtained in each case is at least 80 per cent.

William Wallace Near Scholarships

Established under the terms of the will of W.W. Near of Toronto, for standing on year's work; one awarded to a student in each of the following programs: Engineering Chemistry, Chemical Engineering and Civil Engineering.

P.E. Newbury Prize in Geological Sciences and Geological Engineering

Established by the late Mrs. Peggy Ethel Newbury. Awarded in the Fall on the recommendation of the Department of Geological Sciences and Geological Engineering for outstanding achievement in geological field work, with at least second class standing in the previous year's academic work.

Northeastern Chemical Association Scholarship

Details of this award are given in the section on *Second Year Awards*.

Novelis Scholarship

Details of this award are given in the section on *Second Year Awards*.

Ontario Professional Engineers Foundation for Education

Details of this award are given in the section on *First Year Awards*.

David Parkes Scholarship in Applied Science

Details of this award are given in the section *Second Year Awards*.

Christopher Petrie Memorial Prize in Physics

Awarded to a student in either Engineering and Applied Science or Arts and Science who has obtained a first class standing in a third year laboratory course in experimental physics and who, in the opinion of the department, shows the most promise of future achievement in experimental physics.

Mark Pettit Memorial Prize

Established in April 2002 by friends and family in memory of Mark Pettit, B.Sc. (Mechanical Eng.) 2000. Awarded annually to a student in the third year of the Mechanical Engineering program in the Faculty of Engineering and Applied Science who has applied and been accepted into the Queen's Undergraduate Internship Program (QUIP). The candidate should demonstrate an enthusiasm for engineering and a proven record of helping his/her classmates, as well as a solid academic record. Nomination forms are available from the Department of Mechanical Engineering and must be submitted to the Department by 15 April. Selection of the candidate is made by the Head of the Department of Mechanical Engineering in consultation with faculty and students.

Frank S. Pichler Memorial Scholarship

Details of this award are given in the section *Second Year Awards*.

Polycorp Ltd./Kumar Scholarship in Mining Engineering

Details of this award are given in the section on *First Year Awards*.

W.T. Pound Engineering Design Award

In memory of William Thomas Pound, who graduated from Queen's University in Mechanical Engineering in 1929. Awarded to a third year student upon completion of MECH 323 Machine Design. The award is directed to the individual who has demonstrated an exceptional understanding of machine design principles, and an outstanding aptitude for creative and innovative design. The selection of the candidate will be made by the Head of the Department in consultation with the course instructors.

Queen's C.A.P. Prize Examination Award

Details of this award are given in the section on *Second Year Awards*.

QUIP International Tuition Award

Established in November 2007 by the Faculty of Engineering and Applied Science and awarded on the basis of academic achievement to international students participating in the Queen's University Internship Program (QUIP). **Value: variable on the basis of available funding and duration of internship.**

James H. Rattray Memorial Scholarships in Applied Science

Details of this award are given in the section on *First Year Awards*.

Major James H. Rattray, M.C. Prize in Mining

Founded by Major J.H. Rattray, M.C., for general proficiency in Mining. Aptitude as well as academic standing to be taken into account in making the award.

Carl Reinhardt Scholarship in Physics

To be awarded annually on the basis of standing at the end of the third year to a student registered in the fourth year of a B.Sc. program in engineering physics or an honours B.Sc. program with concentration in physics who does not already hold an award of higher approximate value.

Rock Mechanics Achievement Scholarship

Established in January 2012 by James F. Archibald and the Rock Mechanics Group of the Robert M. Buchan Department of Mining. Awarded on the basis of academic excellence in the third year course in Applied Rock Mechanics to a student entering the fourth year in Mining Engineering in the Robert M. Buchan Department of Mining. Selection will be made by the Faculty of Engineering and Applied Science Operations Committee (Scholarships).

Alvin Craig Ross Memorial Scholarships in Mineral Processing

Details of these awards are given in the section on *Second Year Awards*.

Science 1944 Memorial Prize

Maintained by the class of Science '44 in memory of members who were killed in World War II. Awarded on basis of extra-curricular student activities. Candidates must have passed all work of year.

A.E. Segsworth Prize

Details of this award are given in the section on *Second Year Awards*.

Raymond H. and Phyllis J. Smart Scholarships

Details of this award are given in the section on *First Year Awards*.

Carolyn F. Small Memorial Award for Design Innovation

Details of this award are given in the section on *Second Year Awards*>

Robert E. Smith Memorial Scholarship in Mining Engineering

Details of this award are given in the section on *Second Year Awards*.

Roberto Rocca/Tenaris Scholarships

Established in April 2010 by Tenaris and the Roberto Rocca Education Program. The scholarships reflect the long-standing commitment of the late Roberto Rocca and Tenaris to supporting education at all levels in countries where the sponsoring companies have a major presence. Throughout his lifetime Roberto Rocca demonstrated an abiding concern for education, founding and supporting a variety of initiatives dedicated to learning at all levels and research. Awarded on the basis of academic excellence to students entering their final year in the Faculty of Engineering and Applied Science. Preference will be given in the following order of priority: (a) female students from Northern Ontario or Alberta; (b) students from Northern Ontario or Alberta; (c) female students. Selection will be made by the Operations Committee (Scholarships) of the Faculty of Engineering and Applied Science. **3 awards**

Walter Thumm Memorial Scholarship in Physics

Established by his family and friends in memory of Walter Thumm, Professor at Queen's until his death in 1977. By his understanding and enjoyment of physics, by his writing and by his own example, he inspired countless students and teachers of physics. Awarded on the recommendation of the Physics Department to a student beyond the second year who has indicated his/her intention of pursuing a career in teaching physics, preferably at the high school level, and who has a strong aptitude in physics as well as a demonstrated commitment to teaching.

Howard Vance Memorial Book Prize

Established in memory of Howard Vance, B.Sc. '70. Awarded annually to the Civil Engineering student proceeding to the final year who, in the opinion of the Department of Civil Engineering, has made the greatest improvement in his/her academic work from second to third year.

WAMIC Scholarship

Established in October 2010 by the Women's Association of the Mining Industry of Canada Foundation and awarded on the basis of academic excellence to students entering year four in the Robert M. Buchan Department of Mining or the Geological Engineering program in the Department of Geological Sciences and Geological Engineering. Selection will be made by the Faculty of Engineering and Applied Science Operations Committee (Scholarships).

William E. White Scholarships in Geological Sciences and Geological Engineering

Details of these awards are given in section on *Second Year Awards*.

Martin Wolff Memorial Prize

Established by Dr. A.R. Bader in memory of Martin Wolff, for standing on year's work. Open to candidates in Civil Engineering.

Fourth Year Awards

L.M. Arkley Prize

Founded by the Scots Run Fuel Corporation of Morgantown, W.Va., in recognition of Professor Arkley's interest in the proper methods of purchasing, analyzing and burning coal. Awarded to a fourth year Mechanical Engineering student or group of students who submits the best paper, supported by an oral presentation, on a subject of the students' choice and with the approval of the Mechanical Engineering Department. Selection will be made by the Department of Mechanical Engineering by 31 March.

Alfred Bader Scholarship in Chemistry

Established by A.R. Bader, M.Sc. (Queen's), Ph.D. (Harvard). Awarded to a student in Arts and Science or in Engineering and Applied Science who has registered in the fourth year and obtained the highest Grade Point Average in Chemistry 311 or Chemistry 345.

Orville and Carmel Brown Scholarship

Details of this award are given in the section on Second Year Awards.

Harold M. Cave Undergraduate Travel Scholarship

Details of this award are given in the section on *Second Year Awards*.

George Christie Design Awards

Established by J.G. Parrett, B.Sc.'89 and W.R. Sherwin, B.Sc.'89 in memory of the late George Christie. The awards are presented to individual students or groups of students in Mechanical Engineering on the basis of their performance in the area of design and product modification in their fourth year Mechanical Engineering Design Project. The selection of award winners will be made by the Department.

Civil 1985 Award

Awarded annually to a 4th year student in Civil Engineering who has contributed to the betterment of campus life through interest in the Engineering Society, Civil Club, campus activities and community affairs. The successful candidate must have maintained a satisfactory academic record. Applications and nominations should be submitted to the Head of the Civil Engineering Department by 31 January.

Charles W. Drury Scholarship in Mechanical Engineering

Details of these awards are given in the section on *Third Year Awards*.

Dynatec Corporation Prize in Mining Engineering

Awarded for combined standing in courses MINE 325 and MINE 444. Details of these awards are given in section on *Fourth Year Awards*.

Willard G. Henry Memorial Scholarship

Established by the family, friends, colleagues and students of the late Dr. Willard Geldard Henry, Professor of Metallurgical Engineering 1962-1981, Head of Department 1977-1981, as a tribute to his outstanding contribution to metallurgical science, his excellence as a teacher and above all, his concern for his fellow man. The scholarship is awarded in the fall on the recommendation of the Head of the Department of Mechanical and Materials Engineering, following consultation with departmental colleagues and students, to a student registered in the fourth year of the Materials Option in the Mechanical Engineering program on the basis of the scholarship, character, industry and contribution to furthering the well-being of the student body. On occasion the scholarship may be given to an exceptional student registered in the third year of the above program.

Shirley C. Kennedy Scholarship in Civil Engineering

Details of this award are given in the section on *Second Year Awards*.

Joan M. Lund Memorial Award

Established by the family and friends of Joan M. Lund, a geophysics student in the Department of Geological Sciences at the time of her death. Awarded in the Fall term in the fourth year of either the Applied Geophysics option, Faculty of Engineering and Applied Science, or the B.Sc. (Honours, Geological Sciences) with Physics program, Faculty of Arts and Science to the student who has contributed most to the geophysics program in the previous years. The recipient will be decided by the Chairpersons of the Engineering and Applied Science and Arts and Science Curriculum and Liaison committees in consultation with the student members of those committees.

Dr. W.B.F. Mackay Memorial Scholarship in Mechanical and Materials Engineering

Established in May 2007 by family, friends, colleagues and students of the late Dr. William Brydon Fraser Mackay, HD.Sc (1993). Awarded to a student in the fourth year of the Materials Option in the Department of Mechanical and Materials Engineering on the basis of academic excellence and contributions to furthering the well-being of the student body by way of active participation in volunteer activities, project teams, and professional and social activities within the Department. Application is by letter, with resume, to be submitted to the Department of Mechanical and Materials Engineering by 1 October.

Roberta McCulloch Prize in English

Details of this scholarship are given in the section on *Second Year Awards*.

McLean Family Award in Student Design

Details of this award are given in the section on *Second Year Awards*.

Novelis Scholarship

Details of this award are given in the section on *Second Year Awards*.

David Parkes Scholarship in Applied Science

Details of this award are given in the section on *Second Year Awards*.

Polycorp Ltd./Kumar Scholarship in Mining Engineering

Details of this award are given in the section on *First Year Awards*.

Queen's C.A.P. Prize Examination Award

Details of this award are given in the section *Second Year Awards*.

Science 1971 Norman Fritz Memorial Award

Awarded annually to a fourth year student of the Faculty of Engineering and Applied Science who displays conspicuous leadership and management skill in a student-organized faculty activity which has educational value. An example of such an activity might be that of Convenor of the Science Forum. The recipient of the award is to be selected by the Dean of Engineering and Applied Science and the presentation will be made during the first quarter of each calendar year.

A.E. Segsworth Prize

Details of this award are given in the section on *Second Year Awards*.

Carolyn F. Small Memorial Award for Design Innovation

Details of this award are given in the section on *Second Year Awards*.

William E. White Scholarships in Geological Sciences and Geological Engineering

Details of these awards are given in the section on *Second Year Awards*.

Graduation Awards

Applied Rock Mechanics Scholarship

Established in January 2012 by Jamie Archibald and the Rock Mechanics Group of the Robert M. Buchan Department of Mining to honour those in the mining industry who strive to augment rock mechanics training and enhance the safety of all who participate in this industry. Awarded on the basis of academic excellence to a student in the fourth year thesis course in the Robert M. Buchan Department of Mining, who has submitted a thesis that relates to practical applications of rock mechanics principles in mining, or to the development of fundamental applications of rock mechanics practice that may advance studies of enhanced mine safety. Selection will be made by the Faculty of Engineering and Applied Science Operations Committee (Scholarships).

Alan Bauer Memorial Prize in Mining Engineering

Established by friends, colleagues and students of Alan Bauer, former Head of the Department of Mining Engineering, as a tribute to his outstanding contributions in teaching and research to the department. Awarded on the recommendation of the Head of the Department to fourth year graduating students in Mining Engineering at Queen's. Two awards will be made annually for the thesis presentation component of course MINE 434. Awards will be presented on the basis of technical content and presentation skills.

Colin T. Bayne Memorial Award

Founded by the Class of Mechanical Engineering '76 and friends in memory of Colin Thomas Watson Bayne, B.Sc. '76. Awarded to the graduating Mechanical Engineering student who, in the opinion of the Department, has shown most proficiency in innovative design.

Diana Blake Memorial Book Prize

A memorial book prize established by the Alumni and Alumnae Associations of Queen's in memory of the late Diana Blake, who was Assistant Chief Librarian at Queen's and Vice-President of the Alumni Association at the time of her death in February, 1975. Awarded annually in turn to a graduating student in the Faculty of Arts and Science, the Faculty of Engineering and Applied Science, and the School of Business. The appropriate Society will be asked to nominate a student who has attained at least second class standing and who has made a significant contribution to campus life prior to 1 March of the graduating year. Nominations will be received and selection of the recipient will be made by the appropriate Faculty Awards Committee.

Dr. Wallace Graham Breck Memorial Prize in Engineering Chemistry

Established by the family of Dr. Wallace Graham Breck, Sc. 50, M.Sc. 51, PhD (Cantab University), and awarded annually to the graduating student who is the recipient of the University Medal in Engineering Chemistry in the Faculty of Engineering and Applied Science. Selection will be made by the Awards Committee of the Department of Chemical Engineering and approved by the Faculty of Engineering and Applied Science Operations Committee (Scholarships).

H.G. Conn Award

Named in honour of Professor H.G. Conn, who has contributed much to Queen's University. It is awarded to graduating students who have rendered valuable and distinguished service to the Engineering Society and the University in non-athletic, extra-curricular activities.

Conn-Gilbert Award for Excellence in Engineering

To be awarded to a Mechanical Engineering student, in the year in which the student graduates, who has the highest average on the core courses in Thermodynamics.

CSME Gold Medal

Awarded by the Canadian Society for Mechanical Engineering to the student graduating in Mechanical Engineering who has achieved the highest overall cumulative average in 2nd, 3rd and 4th years.

H.M. Edwards Memorial Award

Established by his family in memory of the late H.M. (Bert) Edwards, B.Sc. '44, MSCE (Purdue), faculty member in Civil Engineering 1946-1985, as a tribute to his outstanding contribution to the Civil Engineering Department and the Faculty. Awarded annually to the graduating student in Civil Engineering who, in the opinion of the Head of the Department and the Civil Engineering Scholarship Committee, has demonstrated notable proficiency in all fourth year courses.

Dynatec Corporation Prize

Details of this award are given in the section *Fourth Year Awards*.

D.S. Ellis Memorial Award

Given by the class of Science '55 as a memorial to Dean D.S. Ellis. Awarded to graduating student who, in the opinion of classmates, has contributed to the University life through extra-curricular activities and athletics and has maintained satisfactory academic standing.

Engineering Society Award

Awarded by the Engineering Society to honour a student in the fourth year who is not a member of the Engineering Society Executive and who has contributed considerably to the welfare of the Engineering Society.

Engineering Physics Design Award

Awarded to the graduating student in Engineering Physics whose Engineering Physics thesis is judged, by the examiners, to be the best on the basis of design, engineering content, innovation and presentation.

D.M. Jemmett Award

Awarded to a student graduating from the Electrical and Computer Engineering Department who has achieved the highest average in Electrical Engineering courses of all years. Average is based on marks of final examinations and not on results of any repeated courses.

B.E.C. Joyce Memorial Award

Awarded to student graduating in Chemical Engineering who, in the opinion of classmates and department staff, is the outstanding graduate in Chemical Engineering.

Shirley C. Kennedy Scholarship in Civil Engineering

Details of this award are given in the section *Second Year Awards*.

Thomas F. LaPierre Award

Awarded annually to a student graduating from the Electrical and Computer Engineering Department who has achieved the highest honours standing in the program.

S.D. Lash Scholarship

Awarded to a graduating student in the Department of Civil Engineering to encourage travel during the summer preceding the start of a graduate program at any University, in order to give the recipient an appreciation of practical problems in their field of interest. Application is by letter, describing the studies they wish to pursue and the places they would like to visit, to be submitted to the Department of Civil Engineering by March 31. Selection will be made by the Departmental Scholarship Committee.

Boyd Lemna Award

Established by Science '92 in honour of their classmate Boyd Lemna. Awarded annually by the Engineering Society to a mature graduating student(s) who has completed an engineering degree in four years. Preference will be given to students who are parents.

Annie Bentley Lillie Prize in Mathematics

Awarded to graduating student in program in Mathematics and Engineering who has highest average on courses in Mathematics in final year.

Thayer Lindsley Book Prize

Established in memory of Thayer Lindsley and awarded to the graduating student in Geological Engineering in the Faculty of Applied Science, or Geological Sciences in the Faculty of Arts and Science, who has contributed the most to his or her year as judged by staff and students in the Department of Geological Sciences and Geological Engineering.

Michele Mainland Memorial Graduating Scholarship in Chemical Engineering

Established in memory of Michele Mainland, B.Sc. '97, by family, friends, and fellow students to honour Michele's love of learning and education. Awarded to a student graduating in Chemical Engineering with the highest academic standing and who is continuing to post-graduate studies either at Queen's or at another institution. Candidates should submit a letter of application to the Head of the Department by 1 April detailing their intended course of study. The recipient will receive the award in the Fall Term on confirmation of registration in graduate school.

Michele Mainland Memorial Medal in Chemical Engineering

Established in memory of Michele Mainland by family, friends and fellow students in recognition of Michele's efforts and courage. Awarded to a graduating Chemical Engineering student who, in the opinion of classmates and department staff, best exemplifies Michele's personal qualities: persistence and cheerfulness in the face of adversity, sense of adventure, tenacity, courage and helpfulness to others.

C.W. Marshall Memorial Award

Awarded annually to graduating student in Civil Engineering who, in opinion of the instructors, has demonstrated notable proficiency in field of structural engineering during third and fourth years and whose academic proficiency has not been identified by a General Proficiency Medal or other distinctive honour.

J.D. McCowan Prize in Integrated Learning

Established by colleagues and friends in recognition of the contribution made by Dr. James D. McCowan to the Integrated Learning Initiative in the Faculty of Engineering and Applied Science. Awarded to a graduating student or graduating members of a student team that have made a significant contribution to the Integrated Learning Initiative during their time in the Faculty of Engineering and Applied Science. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

F.K. McKean, Science 1940, Prize in Mining Engineering

Established by the McKean family in memory of Fleetwood K. McKean, Science '40. Awarded to the student in Mining Engineering who best demonstrates good written communication in the final year thesis. Selection will be made by the Department of Mining Engineering by 31 March.

The Edward Hugh McLellan Memorial Scholarship in Coastal Geotechniques

Established in memory of Edward Hugh McLellan, Sc. '80. Awarded annually to the Civil Engineering student with the highest aggregate standing in CIVL 342 and CIVL 456.

Glen Chandler Milbourne Memorial Scholarship

The Glen Chandler Milbourne Memorial Scholarship has been established by his family, friends and colleagues to perpetuate the values Glen demonstrated during his time at Queen's. The scholarship is awarded on the basis of academic performance to a student graduating from the Materials Option in Mechanical Engineering, who best exemplifies Glen's interpersonal and communication skills, his dedication to teamwork and sportsmanship and his interest and proficiency in the metallurgical profession. In the case of students being equally eligible, preference will be given to a student who is continuing to graduate studies in the Materials and Metallurgical program at Queen's. The selection is made by the Head of the Department in consultation with faculty and students.

L.A. Munro Award in Engineering Chemistry

Established by Professor L.A. Munro, who for many years was a member of the Department of Chemistry at Queen's. The award is presented annually for general proficiency to a graduating student of the Engineering Chemistry program.

O'Connor Associates Award in Geotechnical Engineering

Awarded annually on the recommendation of the Head of the Department of Civil Engineering, in consultation with geotechnical engineering instructors, to a graduating student in Civil Engineering or Geological Engineering (Geotechnical Option) who has demonstrated notable proficiency in the area of geotechnical engineering.

Ontario Professional Engineers Foundation for Education Medal for Academic Achievement

Given by the Ontario Professional Engineers Foundation of Education, and awarded to the student with highest academic standing in the final year. Selection will be made the Engineering and Applied Science Operations Committee (Scholarships).

Paithouski Prize

Established in memory of Nicholas J. Paithouski (B.Sc. '40) by his son N. Joseph Paithouski (B.Sc. '80) and friends and awarded to the graduating engineering student who has demonstrated the most consistent improvement in academic performance. The cumulative annual point spread in sessional average over the most recent eight terms will be used as a basis for determining the winner. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

L.J. Patterson Prize in Mine Management

Founded by Lewis J. Patterson, retired President of Quebec Cartier Mining Company, who taught management within the Mining Engineering Department for 10 years. Awarded, on the recommendation of the Head of the Department, to a student graduating in Mining Engineering who has obtained the highest combined standing in fourth year mine management courses.

Queen's C.A.P. Prize Examination Award

Details of this award are given in the section *Second Year Awards*.

Carolyn F. Small Memorial Award for Design Innovation

Details of this award are given in the section *Second Year Awards*.

E.T. Sterne Prize

Founded by Dr. E.T. Sterne and awarded annually to student graduating in Chemical Engineering who has highest aggregate standing in Chemical Engineering subjects taken throughout undergraduate years.

J.B. Stirling Gold Medal in Applied Science

Awarded annually to a student of the graduating class who has made the highest standing throughout the four year program. A student who has failed a year is not eligible. Selection will be made by the Engineering and Applied Science Operations Committee (Scholarships).

Society of Chemical Industry Student Merit Award

Established by the Canadian Section of the Society of Chemical Industry to encourage scientific education in the universities and to recognize student achievement in scientific fields. Awards are given to the students with the highest standing in the final year in each of the four fields of chemical engineering, engineering chemistry, honours chemistry, and honours biochemistry, provided that they have first-class averages and have completed their program in the normal number of years. The award is a plaque bearing the crest of the Society of Chemical Industry and the winner's name, program, University and year.

M. Sullivan and Son Limited Scholarship

Established in December 2005 by the Sullivan family and awarded to a graduating student in Chemical Engineering or Engineering Chemistry in the Faculty of Engineering and Applied Science or Chemistry in the Faculty of Arts and Science on the basis of outstanding achievement for a research project in Chemistry. Selection will be made by the Departmental Awards Committee and approved by the Awards Committee of the Faculty of Engineering and Applied Science and the Faculty of Arts and Science.

Walter Thumm Memorial Scholarship in Physics

Details of this award are given in the section on *Third Year Awards*.

University Medals

May be awarded annually in each department to student of the graduating class who has highest average in all courses of third and fourth years, provided average is 80 percent or higher.

Peter R. White Memorial Award

Given as a memorial to Peter R. White by his friends and awarded to graduating student in Engineering and Applied Science who has made the most outstanding contribution to the creative arts and the development of inter-personal relations both on and off campus. Nominations will be submitted by the Engineering Society to the Engineering and Applied Science Operations Committee (Scholarships).

E.B. Wilson Memorial Prize in Mining Engineering

Established by family, friends, colleagues and students of the late Edward B. Wilson, Professor of Mining Engineering 1964-1983, as a tribute to his outstanding contribution to the Mining Department and excellence as a teacher. Awarded annually on the recommendation of the Head of the Department to the fourth year Mining Engineering student producing the highest rated undergraduate thesis on a topic involving operations research or computer applications in Mining.

Zurbrigg Memorial Scholarship

Established by H.F. Zurbrigg, Science '31, in memory of his parents and awarded to a Canadian graduate of the Faculty of Engineering and Applied Science who is continuing at Queen's either as a post-graduate in any faculty or as an undergraduate in the faculties of Law or Medicine. The award is made on the basis of scholarship and proficiency in the use of the English language. Applicants must submit by 31 March a letter to the Chair of the Engineering and Applied Science Scholarships Committee detailing their background and career objectives. The recipient will receive the award in the Fall Term on confirmation of registration.

Online Undergraduate Courses in Engineering

The Faculty of Engineering and Applied Science (FEAS) at Queen's is committed to providing flexibility and accessibility in our curriculum. As such, we provide one fully online undergraduate program and several fully online courses.

Fully online undergraduate program:

Bachelor of Mining Engineering Technology (online)

Fully online courses available for Bachelor of Applied Science (BASC) and Letter of Permission students:

- APSC 221 (Offered F16, W17, S17)
- MECH 221 (Offered S17)
- MINE 472 (Offered W17)
- MECH 241 (Offered S17)
- MTHE 225 (Offered S17)

Fully online courses available for Bachelor of Mining Technology (BTECH) students (Offered Based on Demand):

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| • MNTC P01 | • MNTC 311 |
| • MNTC P02 | • MNTC 312 |
| • MNTC P03 | • MNTC 399 |
| • MNTC P04 | • MNTC 413 |
| • MNTC P05 | • MNTC 414 |
| • MNTC P06 | • MNTC 415 |
| • MNTC 301 | • MNTC 416 |
| • MNTC 302 | • MNTC 417 |
| • MNTC 303 | • MNTC 418 |
| • MNTC 304 | • MNTC 419 |
| • MNTC 305 | • MNTC 420 |
| • MNTC 306 | • MNTC 421 |
| • MNTC 307 | • MNTC 422 |
| • MNTC 308 | • MNTC 423 |
| • MNTC 309 | • MNTC 424 |
| • MNTC 310 | • MNTC 499 |

To apply for registration in an FEAS online course:

Existing Queen's students, please visit SOLUS to enroll.

For non-Queen's undergraduate students, use the Queen's Online Application Portal to apply for a course with a Letter of Permission.