

Calendar Home

One Hundred and Twenty Second 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 (<http://engineering.queensu.ca/Calendars/>)

Address

Faculty of Engineering and Applied Science
Beamish-Munro Hall
Queen's University
Kingston Ontario
Canada
K7L 3N6

Telephone

613 533-2055

Fax

613 533-2721

E-mail Address

engineering.reception@queensu.ca

Web Pages

<http://engineering.queensu.ca/>

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 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.

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.

Challenge Examinations

Tests of competence in First Year subjects at the beginning of the year.

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 2015. See Sessional Dates for a complete list.

Registration	Fall: 1 September	SOLUS becomes available to complete the final step of the registration process for students who have pre-registered and pre-paid.
	1 Sept	Tuition payment or Alternate Payment Arrangement due.
	Winter: 10 January	Last day to register without financial penalty for students not registered in any other courses.
Orientation Week	7 - 11 Sept.	

Late Registration		<ul style="list-style-type: none"> a. After 25 September, students must submit a written appeal for late registration to the Operations Committee. If the appeal is granted, the late fee will apply b. After 1 November (after 1 Feb-winter term) no more registrations are accepted.
Classes Begin and End	Fall: 14 Sept	Classes begin
	4 December	Classes end
	Winter: 4 January	Classes begin
	1 April	Classes end
	Spring: 2 May	Classes begin
	10 June	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	25 September	Last date to add Fall Term courses and Fall-Winter courses.
	15 January	Last date to add Winter Term courses.
Dropping	Fall: 1 Sept	Last date to obtain full refund **
	25 September.	Last date to drop voluntarily
	Fall-Winter: 1 Sept	Last date to obtain full refund **
	15 Jan.	Last date to drop voluntarily
	Winter: 1 Jan	Last date to obtain full refund **

Complete Withdrawal from the University	25 September (January 15 for the winter term)	Last date to withdraw and obtain a full refund **
	22 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	15-19 February	
	1 March	Academic Plan Selection for First Year Students Deadline
Exam Dates	Fall: 9-23 December	
	Winter: 7-23 April	
Convocation	Fall	17/18 November
	Spring	TBA
Pre-registration 2016	Classes begin Get "Appointment Date" (pre-registration start date & time) from SOLUS starting approximately 20 June. 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

11	January	Extended Program classes begin for Fall courses.
22	January	Last day to add a Fall Extended Program course.

25	January	Last day to drop a Fall Extended Program course.
15-19	February	Extended Program Fall course examinations.
22	February	Extended Program classes begin for Winter courses.
26	February	Last day to drop a Regular Academic Plan Winter term course.
29	February	Last day to drop APSC 151 and/or APSC 161 rewrite examination.
29	February	Last day to add APSC 151 and/or APSC 161 rewrite examination in April.
7	March	Last day to add a Winter Extended Program course.
28	March	Last day to drop a Winter Extended Program course.
1	May	Extended Program fees due.
2	May	Extended Program Spring term begins.
10	June	Extended Program classes end.
13-17	June	Extended Program Winter course examinations.

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 Science in Engineering. Five-year plans, which include an Internship, lead to the degree of Bachelor of 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;
ENGINEERING SCIENCES Extension of Mathematics and Basic Sciences toward creative applications;
ENGINEERING DESIGN The application of Mathematics, Science, and Engineering Science to meet specific needs;
and
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.

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 | 3.5

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 Years Studies

First Year Studies, B.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.

First Year Curriculum

- APSC 100 Engineering Practice I S | K11

- APSC 111 Mechanics F | 3.5
- APSC 112 Electricity and Magnetism W | 3.5
- APSC 131 Chemistry and Materials F | 3.5
- APSC 132 Chemistry and its Applications W | 3.5
- APSC 142 Introduction to Computer Programming for Engineers F/W | 3
- APSC 151 Earth Systems and Engineering F | 4
- APSC 161 Engineering Graphics F | 3.5
- APSC 171 Calculus I F | 3.5
- APSC 172 Calculus II W | 3.5
- APSC 174 Introduction to Linear Algebra W | 3.5

Minimum Total Credits: 46

Challenge Examinations in Year One Subjects: Prior Learning Assessment

Exceptionally well qualified applicants who feel that their preparation would allow them to follow an accelerated plan of study are encouraged to write challenge examinations that are available in most of the First Year courses. These examinations are usually written during the first week of term in September and are only available to those students who have not yet started any classes in Engineering and Applied Science. Application to write should be made to the First Year Program Assistant, (613) 533-2055, engineering.reception@queensu.ca, before 31 July. There is a special fee for each Challenge examination (see the section on Fees.)

Credit will be granted for those First Year courses in which competence is indicated by the results of the challenge examinations. A student may then elect to reduce the First Year curriculum by those courses for which exemption has been obtained, or elect to undertake an accelerated curriculum by replacing those courses with more advanced courses. Students who wish to preserve their eligibility for scholarship standing will need to formulate a program which provides the same or greater unit load as the standard First Year curriculum.

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 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 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.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.

First Year Curriculum

- APSC 100 Engineering Practice I S | K11
- APSC 111 Mechanics F | 3.5
- APSC 112 Electricity and Magnetism W | 3.5
- APSC 131 Chemistry and Materials F | 3.5
- APSC 132 Chemistry and its Applications W | 3.5
- APSC 142 Introduction to Computer Programming for Engineers F/W | 3
- APSC 151 Earth Systems and Engineering F | 4
- APSC 161 Engineering Graphics F | 3.5
- APSC 171 Calculus I F | 3.5
- APSC 172 Calculus II W | 3.5
- APSC 174 Introduction to Linear Algebra W | 3.5

Minimum Total Credits: 46

Challenge Examinations in Year One Subjects: Prior Learning Assessment

Exceptionally well qualified applicants who feel that their preparation would allow them to follow an accelerated plan of study are encouraged to write challenge examinations that are available in most of the First Year courses. These examinations are usually written during the first week of term in September and are only available to those students who have not yet started any classes in Engineering and Applied Science. Application to write should be made to the First Year Program Assistant, (613) 533-2055, engineering.reception@queensu.ca, before 31 July. There is a special fee for each Challenge examination (see the section on Fees.)

Credit will be granted for those First Year courses in which competence is indicated by the results of the challenge examinations. A student may then elect to reduce the First Year curriculum by those courses for which exemption has been obtained, or elect to undertake an accelerated curriculum by replacing those courses with more advanced courses. Students who wish to preserve their eligibility for scholarship standing will need to formulate a program which provides the same or greater unit load as the standard First Year curriculum.

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 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 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 chemical and biochemical engineering concepts, while strengthening knowledge in chemistry and mathematics. 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 (technical communication, technical entrepreneurship, process economics and project management). In fourth year, students work in groups on design projects and select from courses involving client-based industrial consulting projects, or research projects under the supervision of academic staff or professional engineers.

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. A compulsory one-time \$10 fee for an I-Class token providing students 24-hour access during the academic school year (September to May) to Dupuis Hall as well as to the Department's computer cluster. Computer equipment within the cluster is equipped with software programs that are required for use in various CHEE courses. The fee is payable to the Department of Chemical Engineering, Dupuis Hall, Room 201 (debit or credit card only please).

Biochemical Engineering - Biochemical/Biomedical Stream Sub-Plan, B. Sc. (2016)

Second Year CORE 2013-2014

- 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 | 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 | 3.5

Minimum Total Credits: 45.25

Third Year CORE 2014-2015

- CHEE 310 Fundamentals of 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 ²
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 332 Design of Unit Operations W | 3.5
- CHEE 360 Technical Communications W | 1.5
- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Technical Elective (Minimum 3 Credits) F/W | 3 ³
- ELECTIVE Complementary Studies, List A, B, C or D (3 Credits) F/W | 3 ³

Minimum Total Credits: 43

¹CHE2a students take CHEE 342 in 3rd year and CHEE 340 in 4th year. CHE2a students may replace CHEE 342 with an elective from the CHE1 Group A TECH list.

²CHE2 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.

³Electives 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 2015-2016

- 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 | 6.25
- CHEE 340 Biomedical Engineering W | 3.5 ¹
- ELECTIVE Technical Electives (Minimum 6 Credits) F or W | 6
- ELECTIVE Complementary Studies, List A, B, C or D (6 Credits) F or W | 6

Plus One Of:

- APSC 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 405 Biochemical/Biomedical Research Project FW | 7

Minimum Total Credits: 35.25

¹CHE2a students take CHEE 342 in 3rd year and CHEE 340 in 4th year. CHE2a students may replace CHEE 342 with an elective from the CHE1 Group A TECH list.

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

Students in the Biochemical Engineering Sub-plan - Biochemical/Biomedical Stream (CHE2a) 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 Biochemical/Biomedical stream list.

Students in the Biochemical Engineering Sub-Plan take the following technical electives.

1. One (1) technical elective must be taken from the CHE1 Group A list.
2. Two (2) technical electives from the relevant stream sub-plan list (CHE2a Biochemical/Biomedical stream or CHE2b Environmental stream).

Chemical Process Engineering 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 360 (these are CORE courses).

Biochemical Engineering - Environmental Stream Sub-Plan, B. Sc. (2016)

Second Year CORE 2013-2014

- 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 | 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 | 3.5

Minimum Total Credits: 45.25

Third Year CORE 2014-2015

- CHEE 310 Fundamentals of 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 ¹
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 332 Design of Unit Operations W | 3.5
- CHEE 360 Technical Communications W | 1.5
- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Technical Elective (Minimum 3 Credits) F or W | 3 ²
- ELECTIVE Complementary Studies List A, B D or D (3 Credits) F or W | 3 ²

Minimum Total Credits: 43

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 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 2015-2016

- 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 | 6.25
- CHEE 340 Biomedical Engineering W | 3.5 ¹
- ELECTIVE Technical Electives (Minimum 6 Credits) F or W | 6
- ELECTIVE Complementary Studies, List A, B, C or D (6 Credits) F or W | 6

Plus One Of:

- APSC 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 406 Bioenvironmental Research Project FW | 7

Minimum Total Credits: 35.25

¹ CHE2b students may replace CHEE 340 with an elective from the CHE1 Group A List.

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

Students in the Biochemical Engineering Sub-plan - Environmental Stream (CHE2b) 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 Environmental stream list.

Students in the Biochemical Engineering Sub-Plan take the following technical electives.

1. One (1) technical elective must be taken from the CHE1 Group A list.
2. Two (2) technical electives from the relevant stream sub-plan list (CHE2a Biochemical/Biomedical stream or CHE2b Environmental stream).

Chemical Process Engineering 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.

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 360 (these are CORE courses).

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

Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan, B. Sc. (2017)

Second Year CORE 2014-2015

- 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 | 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 | 3.5

Minimum Total Credits: 45.25

Third Year CORE 2015-2016

- CHEE 310 Fundamentals of 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 ²
- CHEE 319 Process Dynamics and Control W | 3.5
- CHEE 332 Design of Unit Operations W | 3.5
- CHEE 340 Biomedical Engineering W | 3.5 ¹
- CHEE 360 Technical Communications W | 1.5
- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Complementary Studies List A, B D or D (3 Credits) F/W | 3 ³

Minimum Total Credits: 43.5

¹ 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.

² 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.

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 2016-2017

- 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 | 6.25
- 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 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 408 Bioengineering Research Project FW | 7

Minimum Total Credits: 34.75

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

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.

Students in the Bioengineering – Biochemical, Biomedical, Bioenvironmental Sub-plan take the following technical electives:

1. One (1) technical elective must be taken from the CHE1 Group A list.
2. Two (2) technical electives from the Group C list.

Chemical Process Engineering 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 360 (these are CORE courses).

Bioengineering - Biochemical, Biomedical, Bioenvironmental Sub-Plan, B. 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 | 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 | 3.5

Minimum Total Credits: 45.25

Third Year CORE 2016-2017

- CHEE 310 Fundamentals of 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 | 3.5
- CHEE 340 Biomedical Engineering W | 3.5²
- CHEE 360 Technical Communications W | 1.5
- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Complementary Studies List A, B D or D (3 Credits) F/W | 3³

Minimum Total Credits: 43.5

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 | 6.25
- 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 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 408 Bioengineering Research Project FW | 7

Minimum Total Credits: 34.75

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

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.

Students in the Bioengineering – Biochemical, Biomedical, Bioenvironmental Sub-plan take the following technical electives:

1. One (1) technical elective must be taken from the CHE1 Group A list.
2. Two (2) technical electives from the Group C list.

Chemical Process Engineering 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 360 (these are CORE courses).

Chemical Engineering - Chemical Process Engineering Sub-Plan, B. 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 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 | 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 | 3.5

Minimum Total Units: 44.25

Third Year CORE 2016-2017

- CHEE 310 Fundamentals of Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4¹
- 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 | 3.5
- CHEE 360 Technical Communications W | 1.5
- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Complementary Studies List A, B, C or D (3 credits) F/W | 3
- ELECTIVE Technical Electives (minimum 3 credits) F/W | 3²

Minimum Total Units: 43

¹ CHE1 students are preloaded into the fall term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

² 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 | 6.25
- CHEE 412 Transport Phenomena in Chemical Engineering 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 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 421 Research Project FW | 7
OR
- CHEE 420 Laboratory Projects III F/W | 4 ¹
AND
- Technical Elective (Group A or Group B) F/W | 3 ¹

Minimum Total Credits: 38.75

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

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

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 Engineering 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 360 (these are CORE courses).

Chemical Engineering - Chemical Process Engineering Sub-Plan, B. Sc. (2016)

Second Year CORE 2013-2014

- 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
- MTHE 225 Ordinary Differential Equations F/W | 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 | 3.5
- ELECTIVE Complementary Studies List A, B D or D (3 credits) F or W | 3¹

Minimum Total Credits: 44.25

¹ Electives can be taken in either the fall or winter term, but recommend taking in the fall term for course load balance.

Third Year CORE 2014-2015

- CHEE 310 Fundamentals of Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4¹
- 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 331 Design of Unit Operations W | 3.5
- CHEE 360 Technical Communications W | 1.5

- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Technical Electives F or W | 9 (minimum 9 credits) ²

Minimum Total Credits: 42.5

¹ CHE1 students are preloaded into the fall term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

² 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 2015-2016

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 470 Design of Manufacturing Processes F | 6.25
- CHEE 412 Transport Phenomena in Chemical Engineering W | 3.5
- ELECTIVE Complementary Studies List A, B D or D (6 credits) F/W | 6
- ELECTIVE Technical Electives (minimum 3 credits) F/W | 3

Plus Two Of:

- APSC 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 421 Research Project FW | 7
OR
- CHEE 420 Laboratory Projects III F/W | 4 ¹
AND
- Technical Elective (minimum 3 credits; Group A or Group B) 3 ¹

Minimum Total Credits: 35.75

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

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

Students in the Process Engineering Sub-plan (CHE1) must take a minimum of twelve (12) credits in technical electives of which a minimum of six (6) 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 Engineering 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 360 (these are CORE courses).

Chemical Engineering - Chemical Process Engineering Sub-Plan, B. Sc. (2017)

Second Year CORE 2014-2015

- 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
- MTHE 225 Ordinary Differential Equations F/W | 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 | 3.5
- ELECTIVE Complementary Studies List A, B, C or D (3 credits) F/W | 3¹

Minimum Total Units: 44.25

¹ Electives can be taken in either the fall or winter term, but recommend taking in the fall term for course load balance.

Third Year CORE 2015-2016

- CHEE 310 Fundamentals of Engineering Innovation and Entrepreneurship F | 3.5
- CHEE 311 Fluid Phase and Reaction Equilibrium F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4¹
- 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 | 3.5
- CHEE 360 Technical Communications W | 1.5
- CHEE 370 Waste Treatment Processes W | 3.5
- ELECTIVE Technical Electives (minimum 6 credits) F/W | 6 ²

Minimum Total Units: 43

¹ CHEE students are preloaded into the fall term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

² 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 2016-2017

- CHEE 418 Strategies for Process Investigations F | 3.5
- CHEE 470 Design of Manufacturing Processes F | 6.25
- CHEE 412 Transport Phenomena in Chemical Engineering W | 3.5
- ELECTIVE Technical Elective (minimum 3 credits) F/W | 3
- ELECTIVE Complementary Studies List A, B, C or D (6 credits) F/W | 6

Plus Two Of:

- APSC 400 Technology, Engineering and Management (TEAM) FW* | 6.5
OR
- APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9
OR
- CHEE 421 Research Project FW | 7
OR
- CHEE 420 Laboratory Projects III F/W | 4
AND
- Technical Elective (Group A or Group B) F/W | 3 ¹

Minimum Total Credits: 35.75

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

Technical Electives

In some cases, a course on this list is already core for a Sub-plan, and that course is therefore excluded as an elective for that Sub-plan. Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered this upcoming year.

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 Engineering 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 360 (these are CORE courses).

Civil Engineering

Department Head K. Novakowski

Chair of Undergraduate Studies P. Champagne

Undergraduate Assistant A. Gencarelli

Office Ellis Hall, Room 241

Telephone (613) 533-2122

Email CIVUGAA@queensu.ca or angelina.gencarelli@queensu.ca

Departmental Web Site <http://www.civil.queensu.ca>

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. Sc. (Class of 2016)

Second Year Common CORE- 2013/14

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CIVL 200 Civil Week I - Professional Skills F | 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 | 3-0-0 | 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: 45.5

Third Year Common CORE -2014/15

- CIVL 300 Civil Week - Professional Skills F | 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 | 3-0-0 | 3
- CIVL 331 Structural Steel Design W | 4
- CIVL 341 Geotechnical Engineering II W | 4
- CIVL 370 Deleted - Fundamentals of Environmental Engineering |
- CIVL 380 Deleted - Applied Sustainability and Public Health in Civil Engineering |
- Management Elective W | 3-0-0 | 3

Minimum Credits: 39.5

Fourth Year Common CORE -2015/16

- CIVL 400 Civil Week - Professional Skills F | 2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies - List A, B, C, or D F | 3-0-0 | 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, GPY, 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

Civil Engineering, B. Sc. (Class of 2017)

Second Year Common CORE- 2014/15

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CIVL 200 Civil Week I - Professional Skills F | 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 | 3-0-0 | 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 -2015/16

- CIVL 300 Civil Week - Professional Skills F | 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 | 3-0-0 | 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 | 3-0-0 | 3

Minimum Credits: 39.5

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

Fourth Year Common CORE -2016/17

- CIVL 400 Civil Week - Professional Skills F | 2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies- List A, B, C, or D F | 3-0-0 | 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, GISQ, 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

Civil Engineering, B. 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 Civil Week I - Professional Skills F | 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 | 3-0-0 | 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 Civil Week - Professional Skills F | 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 | 3-0-0 | 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 | 3-0-0 | 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 Civil Week - Professional Skills F | 2.5
- CIVL 460 Civil Engineering Design and Practice IV FW | K6
- Complementary Studies- List A, B, C, or D F | 3-0-0 | 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

Computer Engineering

Department Head M. Greenspan

Chair of Undergraduate Studies A. Afsahi

Undergraduate Assistant P. Jordan

Office Walter Light Hall, Room 416

Telephone (613) 533-2925

E-mail eceugrad@queensu.ca

Departmental Web Site <http://www.ece.queensu.ca/>

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. Sc. (Class of 2016)

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 – 2013/14

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |
- 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 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 294 Deleted - Electrical and Computer Engineering Laboratory II |
- ELEC 299 Mechatronics Project W | K1.5

Total Credits: 43.75

Remaining Credits Balance: 72.75

Third Year Common CORE – 2014/15

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.5
- ELEC 377 Operating Systems F | 4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 326 Probability and Random Processes W | 3.5
- 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 W | 4

- Electives Choose 4 electives from Electives Lists A or B or C (see lists under 4th year below) F/W | 12

- Complementary Studies List A F/W | 3-0-0 | 3

Total Credits: 39.5 or 40.5

Remaining Credits Balance: 33.25 or 32.25

Fourth Year Common CORE – 2015/16

- 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 | 23.25 or 22.25
- Complementary Studies, List A, B, C or D F/W | 3

Minimum Total Credits: 33.25 or 32.5

Remaining Credits Balance: 0

* with Departmental and instructor support, students may request to substitute APSC 381 and APSC 480 for ELEC 390 and ELEC 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 Electrical 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, B. Sc. (Class of 2017)

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 – 2014/15

- 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 – 2015/16

- ELEC 371 Microprocessor Interfacing and Embedded Systems F | 4.5
- ELEC 377 Operating Systems F | 4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 326 Probability and Random Processes W | 3.5
- 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 W | 4

- Electives Choose 4 electives from Electives Lists A or B or C (see lists under 4th year below) F/W | 12
- 1 of Complementary Studies List A F/W | 3-0-0 | 3

Total Credits: 39.5 or 40.5

Remaining Credits Balance: 32.5 or 31.5

Fourth Year Common CORE – 2016/17

- 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 | 22.5 or 21.5
- Complementary Studies, List A, B, C or D F/W | 3

Minimum Total Credits: 32.5 or 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 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 Electrical 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. 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 371 Microprocessor Interfacing and Embedded Systems F | 4.5
- ELEC 377 Operating Systems F | 4
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- ELEC 326 Probability and Random Processes W | 3.5
- 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 W | 4

- Electives Choose 4 electives from Electives Lists A or B or C (see lists under 4th year below) F/W | 12
- 1 of Complementary Studies List A F/W | 3-0-0 | 3

Total Credits: 39.5 or 40.5

Remaining Credits Balance: 32.5 or 31.5

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 | 22.5 or 21.5
- Complementary Studies, List A, B, C or D F/W | 3

Minimum Total Credits: 32.5 or 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 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 Electrical 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).

Electrical Engineering

Department Head M. Greenspan

Chair of Undergraduate Studies A. Afsahi

Undergraduate Assistant P. Jordan

Office Walter Light Hall, Room 416

Telephone (613) 533-2925

E-mail eceugrad@queensu.ca

Departmental Web Site <http://www.ece.queensu.ca/>

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. Sc. (Class of 2016)

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 – 2013/14

- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |
- 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 274 Computer Architecture W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 280 Fundamentals of Electromagnetics W | 3.75
- ELEC 294 Deleted - Electrical and Computer Engineering Laboratory II |
- ELEC 299 Mechatronics Project W | K1.5
- MTHE 228 Complex Analysis W | 3.5

Total Credits: 43.75

Remaining Credits Balance: 72.75

Third Year Common CORE – 2014/15

- 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 | 4.5
- 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 W | 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

Total Credits: 41.25

Remaining Credits Balance: 31.5

Fourth Year Common CORE – 2015/16

- 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, B. Sc. (Class of 2017)

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 – 2014/15

- 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 – 2015/16

- 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 | 4.5
- 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 W | 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

Total Credits: 41.25

Remaining Credits Balance: 31.25

Fourth Year Common CORE – 2016/17

- 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: 31.25

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. 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 | 4.5
- 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 W | 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

Total Credits: 41.25

Remaining Credits Balance: 31.25

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: 31.25

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).

Engineering Chemistry

Department Head P.J. McLellan

Chair of Undergraduate Studies M.F. Cunningham

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 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, courses in the latter years allow for specialization in three areas: Advanced Materials, Environmental Chemistry and Biosciences.

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. Currently this consists of a compulsory one-time \$10 fee for an I-Class token providing students 24-hour access during the academic school year (September to May) to Dupuis Hall as well as to the Department's computer cluster. Computer equipment within the cluster is equipped with software programs that are required for use in various CHEE courses. The fee is payable to the Department of Chemical Engineering, Dupuis Hall, Room 201 (debit or credit card only please).

Engineering Chemistry, B. Sc. (Class of 2016)

Second Year Common CORE 2013-2014

- 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 | 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 | 3.5
- ELECTIVES F or W | 6

Minimum Total Credits: 49.5

Third Year Common CORE 2014-2015

- CHEE 209 Analysis of Process Data 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
- ENCH 312 Transition Metal Chemistry F | 3.5
- ENCH 346 Quantum Mechanics and Molecular Simulation F | 3.5
- CHEE 315 Laboratory Projects II F/W | 4¹
- CHEE 323 Industrial Catalysis W | 3.5
- CHEE 333 Design of Unit Operations W | 3.5
- CHEE 360 Technical Communications W | 1.5
- ENCH 345 Applied Organic Chemistry II W | 3
- ENCH 398 Experimental Chemistry I F | 3.5²
OR
- ENCH 399 Experimental Chemistry II W | 3.5²
- Electives (minimum 3 credits) F/W | 3

Minimum Credits: 43

¹ ENCH students are preloaded into the winter term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

² ENCH students can choose either ENCH 398 or ENCH 399, but are preloaded into the winter term to maintain a balanced course load.

Fourth Year Common CORE 2015-2016

- CHEE 460 NOT OFFERED THIS YEAR - Applied Surface and Colloid Science F | 3.5¹

- CHEE 470 Design of Manufacturing Processes F | 6.25
- ENCH 417 Research Project FW* | 9
- CHEE 461 Electrochemical Engineering W | 3.5
- Electives (minimum 18 credits) F/W | 18

Plus One Of:

- CHEE 380 Biochemical Engineering F | 3.5²
- CHEE 340 Biomedical Engineering W | 3.5²

Minimum Total Credits: 43.75

¹ CHEE 460 will not be offered in 2015-2016; ENCH students in 4th year will instead choose an elective from the Group A TECH list and add the course during registration.

ENCH students are preloaded into the winter term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

² CHEE 450 will not be offered in 2015-2016; ENCH students in 4th year will instead choose either CHEE 340 or CHEE 380 and add the course 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. Either APSC 221 or CHEE 310 to meet the engineering economics requirement of their program. Typically, this course would be taken in year 2 or year 3. NOTE: The course is NOT preloaded like CORE courses – students will need to register for the course in SOLUS during registration.
2. 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.
3. Three (3) technical elective courses from the approved Group A list (any combination from Materials, Environment, Biosciences, and General lists).
4. Two (2) technical elective courses from the approved Group B list.

NOTE: Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

PLEASE NOTE: Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered for the upcoming year

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 360 (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. Sc. (Class of 2017)

Second Year Common CORE 2014-2015

- 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 | 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 | 3.5

Minimum Total Credits: 47

Third Year Common CORE 2015-2016

- 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 | 3.5
- CHEE 360 Technical Communications W | 1.5
- 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 | 3¹
- CHEE 310 Fundamentals of Engineering Innovation and Entrepreneurship F | 3.5¹

Minimum Credits: 42

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 2016-2017

- CHEE 460 NOT OFFERED THIS YEAR - Applied Surface and Colloid Science F | 3.5
- CHEE 470 Design of Manufacturing Processes F | 6.25
- ENCH 346 Quantum Mechanics and Molecular Simulation F | 3.5
- ENCH 417 Research Project FW* | 9
- CHEE 315 Laboratory Projects II F/W | 4¹
- CHEE 461 Electrochemical Engineering W | 3.5
- Electives (minimum 12 credits) F/W | 12

Plus One Of:

- CHEE 380 Biochemical Engineering F | 3.5²
- CHEE 340 Biomedical Engineering W | 3.5²

Minimum Total Credits: 45.25

¹ ENCH students are preloaded into the winter term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

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

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 courses from the approved Group B list.

NOTE: Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

PLEASE NOTE: Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered for the upcoming year

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 360 (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. 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 | 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 | 3.5

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 | 3.5
- CHEE 360 Technical Communications W | 1.5
- 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 | 3¹
- CHEE 310 Fundamentals of Engineering Innovation and Entrepreneurship F | 3.5¹

Minimum Credits: 42

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 NOT OFFERED THIS YEAR - Applied Surface and Colloid Science F | 3.5
- CHEE 470 Design of Manufacturing Processes F | 6.25
- ENCH 346 Quantum Mechanics and Molecular Simulation F | 3.5
- ENCH 417 Research Project FW* | 9
- CHEE 315 Laboratory Projects II F/W | 4¹
- CHEE 461 Electrochemical Engineering W | 3.5
- Electives (minimum 12 credits) F/W | 12

Plus One Of:

- CHEE 340 Biomedical Engineering W | 3.5²
- CHEE 380 Biochemical Engineering F | 3.5²

Minimum Total Credits: 45.25

¹ ENCH students are preloaded into the winter term of CHEE 315 (instructor's request), but can change sections and/or terms with the instructor's permission.

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.

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.

NOTE: Some of these elective courses may not be available to students due to pre-requisite course requirements. The student is responsible for confirming that he/she has the necessary prerequisites or permission of the instructor.

PLEASE NOTE: Course availability and the term in which a course is held 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 SOLUS to find out if the TECH course is offered for the upcoming year

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 360 (these are CORE courses).

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

Engineering Physics

Department Head M. Dignam

Chair of Undergraduate Studies Dr. R. Knobel, knobel@physics.queensu.ca

Undergraduate Assistant Melissa Balson, mbalson@physics.queensu.ca

Department Office Stirling Hall, Room 205

Telephone (613) 533-2707

Departmental Web Site <http://www.queensu.ca/physics>

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. Sc. (Class of 2016)

Second Year Common Core - 2013/2014

- 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
- 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

Electrical Sub-Plan (P1)

- ELEC 271 Digital Systems F | 4.25
- ELEC 252 Electronics I W | 4.25
- ENPH 213 Computational Engineering Physics W | 4
- ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |
- ELEC 221 Electric Circuits F | 4.25

Materials Sub-Plan (P3)

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 241 Fluid Mechanics I W | 3.5
- ENPH 213 Computational Engineering Physics W | 4
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25

Mechanical Sub-Plan (P4)

- MECH 230 Thermodynamics I F | 3.5
- ENPH 213 Computational Engineering Physics W | 4
- MECH 241 Fluid Mechanics I W | 3.5
- ELEC 210 Introductory Electric Circuits and Machines W | 4.25

Computing Sub-Plan (P6)

- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 221 Electric Circuits F | 4.25
- ELEC 278 Fundamentals of Information Structures F | 4
- ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |
- ELEC 271 Digital Systems F | 4.25

Third Year Common Core - 2014/2015

- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- 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
- 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

Note:

* MTHE 338 may be replaced by ENPH 312. The second half of ENPH 312 replaces one of the required fourth year Physics List A electives.

** 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
- ELEC 326 Probability and Random Processes W | 3.5

Materials Sub-Plan (P3)

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
- 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)

- CMPE 271 Scientific Computing W | 3
- ENPH 334 Electronics for Applied Scientists F | 5
- CMPE 320 Fundamentals of Software Development W | 4
- ELEC 274 Computer Architecture W | 4
- ENPH 372 Thermodynamics W | 3.5

Fourth Year Common Core - 2015/2016

- 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 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.

Physics List A:

One from Physics List A:

- 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 F | 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 2015/2016 and alternate years thereafter.

² ENPH 495 will be offered in 2014/2015 and alternate years thereafter.

Electrical Sub-Plan (P1)

- ENPH 336 Solid State Devices W | 3.25

Electrical List B:

Two courses from Electrical List B, at least one of which must be numbered above 400:*

- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED THIS YEAR - Bioinformatic Analytics W | 3
- ELEC 421 Digital Signal Processing: Filters and System Design F | 4
- ELEC 422 NOT OFFERED THIS YEAR - Digital Signal Processing: Random Models and Applications F | 3
- ELEC 443 Linear Control Systems F | 4
- ELEC 448 NOT OFFERED THIS YEAR - Introduction to Robotics: Mechanics and Control W | 3.5

- ELEC 451 NOT OFFERED THIS YEAR - Digital Integrated Circuit Engineering F | 3
- ELEC 454 Analog Electronics W | 3.25
- ELEC 457 NOT OFFERED THIS YEAR - Integrated Circuits and System Applications W | 3
- ELEC 461 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 471 Computer Networks I F | 3
- ELEC 476 NOT OFFERED THIS YEAR - Modelling and Systems Simulation W | 3.5
- ELEC 478 NOT OFFERED THIS YEAR - Computer Networks II W | 3
- ELEC 483 NOT OFFERED THIS YEAR - Microwave and RF Circuits and Systems W | 4.5
- ELEC 486 Fiber Optic Communications W | 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 | 3.5
- MECH 423 Introduction to Microsystems F | 3.5
- MECH 425 Engineering for Sustainable Development W | 3.5
- MECH 470 Deformation Processing W | 3.5
- MECH 476 Engineering of Polymers and Composite Materials W | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 479 NOT OFFERED THIS YEAR - Nano-Structured Materials F | 3.5
- MECH 483 Nuclear Materials W | 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 | 3.5
- MECH 420 Vibrations W | 3.5
- MECH 423 Introduction to Microsystems F | 3.5
- MECH 424 Sustainable Product Design W | 3.5
- MECH 425 Engineering for Sustainable Development W | 3.5
- MECH 430 Thermal Systems Design F | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 Turbomachinery F | 3.5
- MECH 441 Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics W | 3.5
- MECH 448 Compressible Fluid Flow F | 3.5
- MECH 452 Mechatronics Engineering F | 4
- 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 Wind Energy F | 3.5
- MECH 482 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 and Genetic Computing F | 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 | 4.5
- 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 THIS YEAR - 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. Sc. (Class of 2017)

Second Year Common Core - 2014/2015

- 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

Electrical Sub-Plan (P1)

- ELEC 271 Digital Systems F | 4.25
- ELEC 252 Electronics I W | 4.25
- ENPH 213 Computational Engineering Physics W | 4

Materials Sub-Plan (P3)

- MECH 270 Materials Science and Engineering F | 3.75
- MECH 241 Fluid Mechanics I W | 3.5
- ENPH 213 Computational Engineering Physics W | 4

Mechanical Sub-Plan (P4)

- MECH 230 Thermodynamics I F | 3.5
- ENPH 213 Computational Engineering Physics W | 4
- MECH 241 Fluid Mechanics I W | 3.5

Computing Sub-Plan (P6)

- CMPE 212 Introduction to Computing Science II F/W | 4
- ELEC 278 Fundamentals of Information Structures F | 4
- CMPE 271 Scientific Computing W | 3

Third Year Common Core - 2015/2016

- 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

Note:

* MTHE 338 may be replaced by ENPH 312. The second half of ENPH 312 replaces one of the required fourth year Physics List A electives.

** 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
- ELEC 326 Probability and Random Processes W | 3.5

Materials Sub-Plan (P3)

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
- 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 W | 4
- ELEC 274 Computer Architecture W | 4
- ENPH 372 Thermodynamics W | 3.5

Fourth Year Common Core - 2016/2017

- 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 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.

Physics List A:

One from Physics List A:

- 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 F | 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 | 3²

Note:

¹ ENPH 491 will be offered in 2015/2016 and alternate years thereafter.

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

Electrical Sub-Plan (P1)

- ENPH 336 Solid State Devices W | 3.25

Electrical List B:

Two courses from Electrical List B, at least one of which must be numbered above 400*:

- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED THIS YEAR - Bioinformatic Analytics W | 3
- ELEC 421 Digital Signal Processing: Filters and System Design F | 4
- ELEC 422 NOT OFFERED THIS YEAR - Digital Signal Processing: Random Models and Applications F | 3
- ELEC 443 Linear Control Systems F | 4
- ELEC 448 NOT OFFERED THIS YEAR - Introduction to Robotics: Mechanics and Control W | 3.5
- ELEC 451 NOT OFFERED THIS YEAR - Digital Integrated Circuit Engineering F | 3
- ELEC 454 Analog Electronics W | 3.25
- ELEC 457 NOT OFFERED THIS YEAR - Integrated Circuits and System Applications W | 3
- ELEC 461 Digital Communications F | 3.5
- ELEC 464 Wireless Communications W | 3
- ELEC 471 Computer Networks I F | 3
- ELEC 476 NOT OFFERED THIS YEAR - Modelling and Systems Simulation W | 3.5
- ELEC 478 NOT OFFERED THIS YEAR - Computer Networks II W | 3
- ELEC 483 NOT OFFERED THIS YEAR - Microwave and RF Circuits and Systems W | 4.5
- ELEC 486 Fiber Optic Communications W | 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 | 3.5
- MECH 423 Introduction to Microsystems F | 3.5
- MECH 470 Deformation Processing W | 3.5
- MECH 476 Engineering of Polymers and Composite Materials W | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 479 NOT OFFERED THIS YEAR - Nano-Structured Materials F | 3.5
- MECH 483 Nuclear Materials W | 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 | 3.5
- MECH 420 Vibrations W | 3.5
- MECH 423 Introduction to Microsystems F | 3.5
- MECH 424 Sustainable Product Design W | 3.5
- MECH 430 Thermal Systems Design F | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 Turbomachinery F | 3.5
- MECH 441 Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics W | 3.5
- MECH 448 Compressible Fluid Flow F | 3.5
- MECH 452 Mechatronics Engineering F | 4
- 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 Wind Energy F | 3.5
- MECH 482 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 and Genetic Computing F | 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 | 4.5
- 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 THIS YEAR - 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. 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 | 3.5

Mechanical Sub-Plan (P4)

- MECH 230 Thermodynamics I F | 3.5
- MECH 241 Fluid Mechanics I W | 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 ENPH 312. The second half of ENPH 312 replaces one of the required fourth year Physics List A electives.

** 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
- ELEC 326 Probability and Random Processes W | 3.5

Materials Sub-Plan (P3)

- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
- 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 W | 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 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 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 F | 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)

- ENPH 336 Solid State Devices W | 3.25

Electrical List B:

Two courses from Electrical List B, at least one of which must be numbered above 400*:

- ELEC 408 Biomedical Signal and Image Processing F | 3
- ELEC 409 NOT OFFERED THIS YEAR - Bioinformatic Analytics W | 3
- ELEC 421 Digital Signal Processing: Filters and System Design F | 4
- ELEC 422 NOT OFFERED THIS YEAR - Digital Signal Processing: Random Models and Applications F | 3
- ELEC 443 Linear Control Systems F | 4
- ELEC 448 NOT OFFERED THIS YEAR - Introduction to Robotics: Mechanics and Control W | 3.5
- ELEC 451 NOT OFFERED THIS YEAR - Digital Integrated Circuit Engineering F | 3
- ELEC 454 Analog Electronics W | 3.25
- ELEC 457 NOT OFFERED THIS YEAR - Integrated Circuits and System Applications W | 3
- ELEC 461 Digital Communications F | 3.5

- ELEC 464 Wireless Communications W | 3
- ELEC 471 Computer Networks I F | 3
- ELEC 476 NOT OFFERED THIS YEAR - Modelling and Systems Simulation W | 3.5
- ELEC 478 NOT OFFERED THIS YEAR - Computer Networks II W | 3
- ELEC 483 NOT OFFERED THIS YEAR - Microwave and RF Circuits and Systems W | 4.5
- ELEC 486 Fiber Optic Communications W | 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 | 3.5
- MECH 423 Introduction to Microsystems F | 3.5
- MECH 470 Deformation Processing W | 3.5
- MECH 476 Engineering of Polymers and Composite Materials W | 3.5
- MECH 478 Biomaterials F | 3.5
- MECH 479 NOT OFFERED THIS YEAR - Nano-Structured Materials F | 3.5
- MECH 483 Nuclear Materials W | 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 | 3.5
- MECH 420 Vibrations W | 3.5
- MECH 423 Introduction to Microsystems F | 3.5
- MECH 424 Sustainable Product Design W | 3.5

- MECH 430 Thermal Systems Design F | 4
- MECH 435 Internal Combustion Engines W | 3.5
- MECH 439 Turbomachinery F | 3.5
- MECH 441 Fluid Mechanics III W | 3.5
- MECH 444 Computational Fluid Dynamics W | 3.5
- MECH 448 Compressible Fluid Flow F | 3.5
- MECH 452 Mechatronics Engineering F | 4
- 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 Wind Energy F | 3.5
- MECH 482 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 and Genetic Computing F | 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 | 4.5
- 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 THIS YEAR - 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

Department Head D.J. Hutchinson
Chair of Undergraduate Studies M. Diederichs
Undergraduate Assistant L. Zarichny
Office Miller Hall, Bruce Wing
Telephone (613) 533-2597
E-mail zarichny@queensu.ca
Departmental Web Site <http://www.queensu.ca/geol/>

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

Geological Engineering at Queen's University prepares students for design challenges related to: energy, water and mineral resource exploration, extraction and management; to environmental protection, management and remediation; to geotechnical design on, with and underneath earth materials; to geo-hazard risk mitigation; and to the non-destructive geophysical investigation of the subsurface environment for engineering purposes. The academic plan provides an enhanced understanding, essential for reliable and sustainable design solutions, of the inherent variability in the engineering properties of earth materials as well as their changes with time and environment and the impact of their genesis on these properties.

The Geological Engineering plan offers a common second year curriculum, to provide students with a foundation in geological sciences and broad 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 specialize by taking several courses in an area of interest, including mineral and energy exploration, geotechnical engineering, geo-environmental engineering, or geophysics. Alternatively, a student can choose to sample a variety of upper year courses in the discipline of Geological Engineering.

Geological Engineering Curriculum

It is recommended that students consult an academic advisor 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 2016, 2017, and 2018. Please refer to the appropriate calendar for your year of graduation.

The Technical Elective List is given at the end of this section. Complementary Studies are discussed at the end of each year calendar entry. Students may take elective courses (5 Technical and 3 Complementary Studies courses) in any of the elective slots available in the 3rd and 4th years of the plan, but usually 2 TECHNICAL Electives and 1 COMPLEMENTARY electives are taken in third year, and 3 TECHNICAL and 2 COMPLEMENTARY electives are taken in fourth year.

Field Work

Field work is a necessary part of Geological Engineering training, and field trips and field projects are offered in each year of study because the Department wishes to provide the best 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 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. A second core field course in fourth year deals with engineering and design issues related to geo-environmental, geotechnical and resource management issues within the mineral industry.

Students entering 2nd year in 2013 and 2014 paid a one-time Field Transportation Levy. The cost of accommodation and food, while on field trips or at field schools, will be borne by the student. Additional transportation fees may apply for students attending numerous field courses.

Students entering 2nd year in 2015 and beyond: 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. 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. Sc. (Class of 2016)

Second Year Common Core – 2013/14 (Class of 2016 Only)

- 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 | 3.5
- MTHE 225 Ordinary Differential Equations F/W | 3.5
- 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 | 4.5
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- GEOE 249 Geophysical Characterization of the Earth W | 3.5
- GEOE 282 Earth Systems Engineering II: Resources and Environment W | 3.5

Take one of:

- MTHE 227 Vector Analysis F | 3
OR
- GEOE 207 History of Life F | 3.5

Intersession (Taken in Spring following 2nd Year)

- GEOE 300 Geological Engineering Field School S | 5

Third Year Common Core – 2014/15 (Class of 2016 only)

- CHEE 209 Analysis of Process Data F | 3.5
- GEOE 321 Analysis of Rock Structures F | 4
- GEOE 343 Applied Hydrogeology F | 3.75
- GEOE 359 Applied Quantitative Analysis in Geological Engineering F | 3.5
- GEOE 362 Resource Engineering W | 3.5
- GEOE 319 Applied Geophysics W | 3
- GEOE 333 Terrain Evaluation W | 4
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- GEOE 365 Geochemical Characterization of the Earth W | 4
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3

Fourth Year Common Core- 2015/16 (Class of 2016 only)

- GEOE 410 Geological Engineering Field School F | 4
- GEOE 446 Engineering Design Project I F | K3
- GEOE 413 Engineering Geology and Rock Engineering Design F | 3.5
- GEOE 447 Engineering Design Project II W | K5
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3

Electives

The Geological Engineering plan requires that each student take 5 Technical Electives and 3 Complementary Studies Electives (below). The Technical Elective list is at the end of the Geological Engineering plan calendar entry. These courses can be taken at any point during the program to accommodate timetabling, but usually 2 TECHNICAL Electives and 1 COMPLEMENTARY electives are taken in third year, and 3 TECHNICAL and 2 COMPLEMENTARY electives are taken in fourth year. Students should plan to ensure that prerequisite and co-requisite requirements are met. 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.

Geological Engineering: Technical Electives

Complementary Studies:

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

Geological Engineering, B. Sc. (Class of 2017)

Second Year Common Core – 2014/15 (Class of 2017 Only)

- 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 | 3.5
- GEOE 238 Surficial Processes, Sedimentation and Stratigraphy W | 4
- CHEE 209 Analysis of Process Data F | 3.5
- APSC 200 Engineering Design and Practice II F/W | K4
- APSC 293 Engineering Communications I F/W | K1
- APSC 221 Economics and Business Practices in Engineering F/W/S | 3
- GEOE 235 Genesis and Characterization of Solid Earth Materials W | 4.5
- GEOE 249 Geophysical Characterization of the Earth W | 3.5
- MTHE 232 Deleted - Differential Equations |

Intersession (Taken in Spring following 2nd Year)

- GEOE 300 Geological Engineering Field School S | 5

Third Year Common Core – 2015/16 (Class of 2017 only)

- GEOE 321 Analysis of Rock Structures F | 4
- GEOE 343 Applied Hydrogeology F | 3.75
- GEOE 359 Applied Quantitative Analysis in Geological Engineering F | 3.5
- GEOE 362 Resource Engineering W | 3.5
- GEOE 319 Applied Geophysics W | 3
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- GEOE 333 Terrain Evaluation W | 4
- GEOE 365 Geochemical Characterization of the Earth W | 4
- Elective F/W | 3
- Elective F/W | 3
- Elective F/W | 3

Fourth Year Common Core- 2016/17 (Class of 2017 only)

- GEOE 207 History of Life F | 3.5
- GEOE 410 Geological Engineering Field School F | 4

- GEOE 446 Engineering Design Project I F | K3
- GEOE 413 Engineering Geology and Rock Engineering Design F | 3.5
- 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

The Geological Engineering plan requires that each student take 5 Technical Electives and 3 Complementary Studies Electives (below). The Technical Elective list is at the end of the Geological Engineering plan calendar entry. These courses can be taken at any point during the program to accommodate timetabling, but usually 2 TECHNICAL Electives and 1 COMPLEMENTARY electives are taken in third year, and 3 TECHNICAL and 2 COMPLEMENTARY electives are taken in fourth year. Students should plan to ensure that prerequisite and co-requisite requirements are met. 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.

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. 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 | 3.5
- 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 | 4.5
- 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 | 3.5

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
- GEOE 343 Applied Hydrogeology F | 3.75
- GEOE 359 Applied Quantitative Analysis in Geological Engineering F | 3.5
- GEOE 362 Resource Engineering W | 3.5
- GEOE 319 Applied Geophysics W | 3
- GEOE 333 Terrain Evaluation W | 4
- GEOE 345 Site Investigation & Geological Engineering Design W | 4
- GEOE 365 Geochemical Characterization of the Earth W | 4
- Elective F/W | 3
- 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
- GEOE 410 Geological Engineering Field School F | 4
- GEOE 446 Engineering Design Project I F | K3
- GEOE 413 Engineering Geology and Rock Engineering Design F | 3.5
- 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

The Geological Engineering plan requires that each student take 5 Technical Electives and 3 Complementary Studies Electives (below). The Technical Elective list is at the end of the Geological Engineering plan calendar entry. These courses can be taken at any point during the program to accommodate timetabling, but usually 2 TECHNICAL Electives and 1 COMPLEMENTARY electives are taken in third year, and 3 TECHNICAL and 2 COMPLEMENTARY electives are taken in fourth year. Students should plan to ensure that prerequisite and co-requisite requirements are met. 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.

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

Department Head R. Murty

Chair of Undergraduate Studies A. Mansouri

Curriculum Chair A. Mansouri

Undergraduate Assistant J. Ng

Office Jeffery Hall, Room 310

Telephone (613) 533-2390

E-mail matheng@mast.queensu.ca

Departmental Web Site <http://www.mast.queensu.ca/meng/>

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. Sc. (Class of 2016)

Second Year Common Core - 2013/2014

- 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 312 Deleted - Linear Algebra |

Applied Mechanics Sub-Plan (M6)

- CIVL 220 NOT OFFERED THIS YEAR - Statics and Solid Mechanics F | 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 | 3.5

Minimum Total Credits: 42

Computing and Communications Sub-Plan (M9)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |
- ELEC 252 Electronics I W | 4.25
- ELEC 274 Computer Architecture W | 4
- ELEC 294 Deleted - Electrical and Computer Engineering Laboratory II |
- ENPH 239 Electricity and Magnetism W | 3.5

Minimum Total Credits: 42.75

Systems and Robotics Sub-Plan (M11)

- ELEC 221 Electric Circuits F | 4.25
- ELEC 271 Digital Systems F | 4.25
- ELEC 293 Deleted - Electrical and Computer Engineering Laboratory I |
- ENPH 225 Mechanics W | 3.5
- ELEC 252 Electronics I W | 4.25
- ELEC 274 Computer Architecture W | 4
- ELEC 294 Deleted - Electrical and Computer Engineering Laboratory II |

Minimum Total Credits: 42.75

Third Year Common Core - 2014/2015

- MTHE 326 Functions of a Complex Variable F | 3
- 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 | K2
- 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: 42

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 | 4.5
- 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: 43

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 | 4.5
- Complementary Studies, List A F | 3
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.5

Fourth Year Common Core - 2015/2016

- 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)

- 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
- CMPE 365 Algorithms I F | 4
- 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. Sc. (Class of 2017)

Second Year Common Core - 2014/2015

- 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 312 Deleted - Linear Algebra |

Applied Mechanics Sub-Plan (M6)

- CIVL 220 NOT OFFERED THIS YEAR - Statics and Solid Mechanics F | 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 | 3.5

Minimum Total Credits: 42

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 - 2015/2016

- MTHE 326 Functions of a Complex Variable F | 3
- 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 | K2
- 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: 43.5

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 | 4.5
- 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: 43

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 | 4.5
- Complementary Studies, List A F | 3
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.5

Fourth Year Common Core - 2016/2017

- 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)

- 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
- CMPE 365 Algorithms I F | 4

- 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. 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 Statics and Solid Mechanics F, O/L | 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 | 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
- 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 | K2
- 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: 43.5

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 | 4.5
- 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: 43

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 | 4.5
- Complementary Studies, List A F | 3
- ENPH 239 Electricity and Magnetism W | 3.5
- MTHE 353 Probability II W | 3

Minimum Total Credits: 42.5

Fourth Year Common Core - 2016/2017

- 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)

- 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
- CMPE 365 Algorithms I F | 4
- 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)

Mechanical Engineering

Department Head: K.J. Deluzio

Chair of Undergraduate Studies: R.W. Sellens, rick.sellens@queensu.ca

Undergraduate Assistant: J. Brown Jacqueline.brown@queensu.ca

General Advisor Email: MME.Advisor@queensu.ca

2nd Year Advisor: G Zak

3rd Year Advisor: I.Y. Kim

4th Year Advisor: J. Lai

Main Office: McLaughlin Hall, Room 319

Telephone: (613) 533-2575

Fax: (613) 533-6489

Departmental Web Site: <http://me.queensu.ca/>

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.Sc. (Class of 2016)

Second Year Common Core- 2013/14

- CIVL 220 NOT OFFERED THIS YEAR - Statics and Solid Mechanics F | 4
- MTHE 225 Ordinary Differential Equations F/W | 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 215 Instrumentation and Measurement F | 3.5
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W | 3.5

Minimum Total Credits: 42.75

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

Third Year Common Core – 2014/15

- 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
- ENPH 333 Deleted - Electronics for Scientists and Engineers |
- 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
- Complementary Studies, List A (recommended) or a Technical Elective* (See Technical Elective List) W (F if in ME3) | Min. 3

General Sub-Plan (ME1)

- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
OR

- MECH 398 Mechanical Engineering Laboratory I F | K2
- 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: 42.5

Materials Sub-Plan (ME2)

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

Minimum Total Credits: 42.5

Biomechanical Sub-Plan (ME3)

- CHEE 442 Biomedical Engineering W | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
OR
- MECH 398 Mechanical Engineering Laboratory I F | K2
- 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: 42.5

Fourth Year Common Core (All Sub-Plans) – 2015/16

- Complementary Studies, List A F or W | 3
- 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.

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: 35

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: 35

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: 35

* Capstone Design Course

All students must take a final year capstone design course in their program; for ME1 and ME2 option, students, this course would normally be MECH 460 (4 credits, Fall) coupled with MECH 464 (1.5 credits, Fall). ME3 option students will normally take MECH 460 (4 credits, Fall) and MECH 464 (1.5 credits, Fall) and MECH 462 (3.5 credits in the 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 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 preloaded courses on Solus, and **ADD** APSC 480, **AND**, all students are limited to taking only **ONE** capstone final year 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 Plan, 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, B.Sc. (Class of 2017)

Second Year Common Core - 2014/15

- CIVL 220 NOT OFFERED THIS YEAR - Statics and Solid Mechanics F | 4
- MTHE 225 Ordinary Differential Equations F/W | 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 215 Instrumentation and Measurement F | 3.5
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W | 3.5

Minimum Total Credits: 43.25

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

Third Year Common Core - 2015/16

- 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)

- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
OR
- MECH 398 Mechanical Engineering Laboratory I F | K2
- 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: 40.5

Materials Sub-Plan (ME2)

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

Minimum Total Credits: 40.5

Biomechanical Sub-Plan (ME3)

- MECH 393 Biomechanical Product Development F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
OR
- MECH 398 Mechanical Engineering Laboratory I F | K2
- 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: 40.5

Fourth Year Common Core - 2016/2017

- 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.

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) 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 preloaded courses on SOLUS, and **ADD** APSC 480, **AND**, 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.

Technical Electives

Mechanical and Materials Engineering: Technical Electives

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

Second Year Common Core- 2015/2016

- MECH 221 Statics and Solid Mechanics F, O/L | 4
- MTHE 225 Ordinary Differential Equations F/W | 3.5
- MECH 213 Manufacturing Methods F | 4.5
- MECH 230 Thermodynamics I F | 3.5
- MECH 215 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 Instrumentation and Measurement Labs W | K2
- MECH 228 Kinematics and Dynamics W | 3.5
- MECH 241 Fluid Mechanics I W | 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. The department cannot possibly guarantee that courses will not conflict when a student changes options or transfers, especially after 2nd year.

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

General Sub-Plan (ME1)

- MECH 330 Applied Thermodynamics II F | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
OR
- MECH 398 Mechanical Engineering Laboratory I F | K2
- 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: 40.5

Materials Sub-Plan (ME2)

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

Minimum Total Credits: 40.5

Biomechanical Sub-Plan (ME3)

- CHEE 340 Biomedical Engineering W | 3.5
- MECH 396 Mechanical and Materials Engineering Laboratory I F | K2
OR
- MECH 398 Mechanical Engineering Laboratory I F | K2
- 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: 40.5

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) 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

Mining Engineering

Department Head T. Katsabanis
Chair of Undergraduate Studies M. Morin
Undergraduate Program Assistant T. McKenna
Office Goodwin Hall, Room 354
Telephone (613) 533-2230
Fax (613) 533-6597
E-mail tina.mckenna@queensu.ca
Departmental Web Site <http://www.mine.queensu.ca>

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. Sc. (Class of 2016)

Second Year Common Core - 2013/2014

- 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 | 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

- 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

Subtotal Credits: 10

Minimum Total Credits: 42

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: 11

Minimum Total Credits: 43

Third Year Common Core - 2014/2015

- 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 - 2015/2016

- 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

Electives

Students may fulfill their elective requirement by selecting any course as listed under Complementary Studies (first year linkage courses excluded) or any third or fourth year Applied Science course for which the prerequisite requirements have been satisfied.

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. Sc. (Class of 2017)

Second Year Common Core - 2014/2015

- 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 | 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: 12

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: 10.5

Minimum Total Credits: 42.5

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: 11

Minimum Total Credits: 43

Third Year Common Core - 2015/2016

- 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 - 2016/2017

- 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

Each of the three options within the Mining program have specific Complementary Studies List A and Elective requirements.

To determine how many Complementary Studies List A and Electives you must take for your program please refer to the Mining Engineering section of the 'Degree Program' area in the current calendar.

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 courses 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. 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
- 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 | 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: 12

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: 10.5

Minimum Total Credits: 42.5

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: 11

Minimum Total Credits: 43

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

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

Each of the three options within the Mining program have specific Complementary Studies List A and Elective requirements.

To determine how many Complementary Studies List A and Electives you must take for your program please refer to the Mining Engineering section of the 'Degree Program' area in the current calendar.

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 Technology

Department Head T. Katsabanis

Chair of Undergraduate Studies M. Morin

Program Coordinator L. Campbell

Office Goodwin Hall, Room 354

Telephone (613) 533-6000 Ext 79312

E-mail btech@engineering.queensu.ca

Departmental Web Site <http://www.btech.engineering.queensu.ca>

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, B.Tech.

Bridge Curriculum Common CORE – 2015/16

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

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

Bridge Curriculum Civil/Mechanical Engineering Technologist Stream – 2015/16

- MNTC P02 Mining Geology W | 3

Bridge Curriculum Mining Engineering Technician Stream – 2015/16

- MNTC P03 Foundational Mathematics F | 3
- MNTC P04 Calculus W | 3
- MNTC P05 Foundational Physics W | 3

Year 3 – 2016/17

Pending curriculum committee approval.

Year 4 – 2017/18

Pending curriculum committee approval.

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 (MGT).

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 Fundamentals of 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 360 Technical Communications W | 1.5
- CIVL 200 Civil Week I - Professional Skills F | 2.5
- CIVL 300 Civil Week - Professional Skills F | 2.5
- CIVL 400 Civil Week - Professional Skills 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:

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 2013-2014:

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

Classics (all CLST **except** CLST 203; GREK 208, 321, 322, 421, 422, and 430; LATN 209, 310, , 321, 322, 327, 421 and 422)

Development Studies (all DEVS)

Drama (DRAM 100, 201, 200, 202, 205, 210, 211, 216, 251, 252, 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)

English language and literature (ENGL only)

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, 339, 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, 395, 396, , 406, , 424, and 477) (FRST 290)

Geography (GPYH 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 181, 308, 309, 311, 317, 419, 426, 427, 429, 433, 441, and 453)

Hebrew (HEBR 135, 191, 292, 391 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 200, 201, 209, 215, 320, 205, 210, 214, 226, 232, 233, 234, 247, 248, 257, 301, 308, 309, 316, 319, 320, 322, 326, 327, 328, 329, 330, 331, 332, 339, 340, 495)

Law (LAW 201 only)

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

Multi-Disciplinary (MDEP 221)

Music (MUSC 101, 102, 103, 171, 203, 204, 205, 289, 326, 333, 480, and 486)

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, 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, 439, 440, 441, 442, 443, 446, 450, 453, 455, and 456)

Religious Studies (all RELS)

Sociology (SOCY 122, 210, 211, 225, 226, 227, 232, 234, 235, 273, 274, 275, 276, 301, 303, 306, 309, 321, 324, 325, 326, 331, 336, 344, 352, 354, 362, 384, 387, 388, 389, 400, 401, 402, 403, 404, 405, 422, 424, 430, 431, 454, 457, 458, 472, 475, 476 and 480)

Spanish and Italian (SPAN 306, 310, 315, 330, 331, 332, 335, 344, 351, 352, 354, 380, 381, 406, 428, 450, 456, 458, 460, 495, and 496; ITLN 310, 331, 332, 357, 408, 415, and 432)

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
- ENSC 200 Environmental History 3
- ENSC 201 Environmental Toxicology and Chemical Risks 3
- ENSC 203 Explorations in Environmental Studies 3
- ENSC 301 Environmental Assessment 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 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)

Chinese Language (CHIN 100, 200 and 300)

Classics (GREK 112; LATN 110)

Creative Writing (CWRI 293-296)

Drama (DRAM 181, 220, 236, 237, 238, 239, 241, 245, 246, 247, 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, 312, 355, 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 061, 101, 102, 201, 202, 203, 306, 307, 312)

Hebrew (HEBR 190, 294, 295, 301, and 390)

Interdisciplinary Studies (IDIS 200, 201, and 311)

Japanese Language (JAPN 100, 200, 301, and 302)

Languages, Literatures and Cultures (LLCU 101, 102)

Linguistics (LING 100, 110, 310, 320, 330, 340, 415, 435, and 475)

Multi-Disciplinary (MDEP 400)

Music (MUSC 052, 124, 153, 180, 181, 187, 188, 189, 191, 224, 253, 255, 270, 280, 281, 283, 285, 291, 324, 329, 351, 352, 354, 355, 392, 396, 398, 424, 439, 446, 454, and 455)

Portuguese (PORT 103 and PORT 104)

Spanish and Italian (SPAN 010, 112, 204, 205, 206, 301, 302, 303, 304 and 410; ITLN 010, 112, 204, 205)

List D – Management 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 School of Urban and Regional Planning

- 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 211 Introduction to Financial Accounting 3
- COMM 212 Introduction to Management Accounting 3
- COMM 221 Introduction to Finance 3
- COMM 231 Introduction to Marketing 3
- COMM 251 Organizational Behaviour 3
- COMM 274 International Business Strategy 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 326 The Economics of Canada's Financial System 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 373 International Negotiations 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

Courses of Instruction

APSC 100 Engineering Practice I S | K11

APSC 101 Engineering Problem Solving and Modeling F | K4

APSC 102 Experimentation and Design F/W | K3

APSC 103 Engineering Design Project W | K4

APSC 111 Mechanics F | 3.5

APSC 112 Electricity and Magnetism W | 3.5

APSC 131 Chemistry and Materials F | 3.5

APSC 132 Chemistry and its Applications W | 3.5

APSC 142 Introduction to Computer Programming for Engineers F/W | 3

APSC 151 Earth Systems and Engineering F | 4

APSC 161 Engineering Graphics F | 3.5

APSC 171 Calculus I F | 3.5

APSC 172 Calculus II W | 3.5

APSC 174 Introduction to Linear Algebra W | 3.5

APSC 191 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 | 3 K4

APSC 221 Economics and Business Practices in Engineering F/W/S | 3

APSC 223 Global Project Management S | K3

APSC 262 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 |

APSC 302 Professional Internship |

APSC 303 Professional Internship |

APSC 304 Professional Internship |

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 Technology, Engineering and Management (TEAM) FW* | 6.5

APSC 480 Multi-disciplinary Industry Engineering Design Project FW | K9

BCHM 310 General Biochemistry FW | 7.5

BCHM 315 Proteins and Enzymes F | 3

BCHM 410 Protein Structure and Function F | 3

BIOL 102 Introductory Biology of Cells F | 3.75

BIOL 103 Introductory to Biology of Organisms W | 3.75

BIOL 205 Mendelian and Molecular Genetics F | 4.5

BIOL 335 Limnology and Aquatic Ecology F | 4.5

BIOM 300 NOT OFFERED THIS YEAR - Modeling Techniques in Biology W | 3.5

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 Fundamentals of 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 | 3.5

CHEE 332 Design of Unit Operations W | 3.5

CHEE 333 Design of Unit Operations W | 3.5

CHEE 340 Biomedical Engineering W | 3.5

CHEE 342 Environmental Biotechnology F | 3.5

CHEE 360 Technical Communications W | 1.5

CHEE 361 Engineering Communications, Ethics & Professionalism W | K1

CHEE 370 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 | 7

CHEE 412 Transport Phenomena in Chemical Engineering W | 3.5

CHEE 418 Strategies for Process Investigations F | 3.5

CHEE 420 Laboratory Projects III F/W | 4

CHEE 421 Research Project FW | 7

CHEE 434 NOT OFFERED THIS YEAR - Process Control II W | 3.5

CHEE 436 NOT OFFERED THIS YEAR - 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 NOT OFFERED THIS YEAR - Applied Surface and Colloid Science F | 3.5

CHEE 461 Electrochemical Engineering W | 3.5

CHEE 470 Design of Manufacturing Processes F | 6.25

CHEE 481 NOT OFFERED THIS YEAR - Air Quality Management W | 3.5

CHEE 484 NOT OFFERED THIS YEAR - Bioremediation W | 3.5

CHEE 490 Polymer Formulations and Processing Technology W | 3.5

CIVL 200 Civil Week I - Professional Skills F | 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 NOT OFFERED THIS YEAR - 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 Civil Week - Professional Skills F | 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 Civil Week - Professional Skills 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 W | 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 W | 4

CMPE 322 Software Architecture F | 4

CMPE 324 Operating Systems W | 3

CMPE 325 Human-Computer Interaction W | 3

CMPE 326 Game Architecture F | 3

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 422 Formal Methods in Software Engineering F | 3

CMPE 425 Advanced User Interface Design F | 3

CMPE 432 Advanced Database Systems F | 3

CMPE 434 Distributed Systems W | 3

CMPE 452 Neural and Genetic Computing F | 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 | 4

CMPE 472 Medical Informatics W | 3

SOFT 423 NOT OFFERED THIS YEAR - Software Requirements W | 3

SOFT 437 NOT OFFERED THIS YEAR - Performance Analysis 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 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 W | 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 | 4.5

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 THIS YEAR - Bioinformatic Analytics W | 3

ELEC 421 Digital Signal Processing: Filters and System Design F | 4

ELEC 422 NOT OFFERED THIS YEAR - 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 F | 4

ELEC 444 Modeling and Computer Control of Mechatronic Systems W | 3.25

ELEC 448 NOT OFFERED THIS YEAR - Introduction to Robotics: Mechanics and Control W | 3.5

ELEC 451 NOT OFFERED THIS YEAR - Digital Integrated Circuit Engineering F | 3

ELEC 454 Analog Electronics W | 3.25

ELEC 457 NOT OFFERED THIS YEAR - Integrated Circuits and System Applications W | 3

ELEC 461 Digital Communications F | 3.5

ELEC 464 Wireless Communications W | 3

ELEC 470 NOT OFFERED THIS YEAR - Computer System Architecture W | 3.5

ELEC 471 Computer Networks I F | 3

ELEC 474 Machine Vision F | 3.5

ELEC 476 NOT OFFERED THIS YEAR - Modelling and Systems Simulation W | 3.5

ELEC 478 NOT OFFERED THIS YEAR - Computer Networks II W | 3

ELEC 483 NOT OFFERED THIS YEAR - Microwave and RF Circuits and Systems W | 4.5

ELEC 486 Fiber Optic Communications W | 3.75

ELEC 487 Deleted - Microwave and Fiber Optic Laboratory W | 0.75

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 | 3.5

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 | 3.5

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 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 Applied Organic Chemistry II W | 3

ENCH 346 Quantum Mechanics and Molecular Simulation F | 3.5

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 Statistical Mechanics W | 3

ENCH 413 NOT OFFERED THIS YEAR - Computational Chemistry W | 3

ENCH 414 Catalysis F | 3

ENCH 415 Electrochemistry and Electrocatalysis F | 3

ENCH 417 Research Project FW* | 9

ENCH 421 Advanced Methods in Physical Chemistry W | 3

ENCH 422 Synthetic Organic Chemistry F | 3.5

ENCH 423 Topics in Inorganic and Organometallic Chemistry F | 3

ENCH 424 Polymer Chemistry W | 3

ENCH 425 NOT OFFERED THIS YEAR - 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 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 F | 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 | 4.5

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 | 3.5

GEOE 282 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 319 Applied Geophysics W | 3

GEOE 321 Analysis of Rock Structures F | 4

GEOE 323 Deleted - Quaternary Glacial Geology |

GEOE 333 Terrain Evaluation W | 4

GEOE 337 Paleontology F | 4

GEOE 340 Problems in Geological Engineering F/W | 3

GEOE 341 Special Topics in Applied Geology S | 3

GEOE 343 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 F | 3.5

GEOE 362 Resource Engineering W | 3.5

GEOE 365 Geochemical Characterization of the Earth W | 4

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 | 4

GEOE 413 Engineering Geology and Rock Engineering Design F | 3.5

GEOE 418 NOT OFFERED THIS YEAR - Petroleum Geology F | 4.5

GEOE 419 Geophysics Field School S | 4

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 | 3

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 462 Advanced Petrogenesis and Metallogenesis W | 4

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 W | 4.5

GEOE 478 NOT OFFERED THIS YEAR - Terrigenous Clastic Sedimentology F | 3.5

GEOE 481 Structural Analysis Applied to Resource Deposits F | 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 Geographic Information Science W | 3

GISC 202 Data Collection, Management and Analysis W | 4

GISC 301 Spatial Analysis F | 3

GISC 302 Environmental Modelling W | 3

GISC 303 Application Design and Customization in GIS F | 3

GPHY 304 Arctic and Periglacial Environments W | 3

MBIO 218 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 | 3.5

MECH 212 Deleted - Design Techniques |

MECH 213 Manufacturing Methods F | 4.5

MECH 215 Instrumentation and Measurement F | 3.5

MECH 216 Instrumentation and Measurement Labs W | K2

MECH 221 Statics and Solid Mechanics F, O/L | 4

MECH 228 Kinematics and Dynamics W | 3.5

MECH 230 Thermodynamics I F | 3.5

MECH 241 Fluid Mechanics I W | 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 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 | K2

MECH 397 Mechanical and Materials Engineering Laboratory II W | K2

MECH 398 Mechanical Engineering Laboratory I F | K2

MECH 399 Mechanical Engineering Laboratory II W | K2

MECH 420 Vibrations W | 3.5

MECH 423 Introduction to Microsystems F | 3.5

MECH 424 Sustainable Product Design W | 3.5

MECH 430 Thermal Systems Design F | 4

MECH 435 Internal Combustion Engines W | 3.5

MECH 439 Turbomachinery F | 3.5

MECH 441 Fluid Mechanics III W | 3.5

MECH 444 Computational Fluid Dynamics W | 3.5

MECH 448 Compressible Fluid Flow F | 3.5

MECH 452 Mechatronics Engineering F | 4

MECH 455 Computer Integrated Manufacturing W | 3.5

MECH 456 Introduction to Robotics F | 3.5

MECH 458 NOT OFFERED THIS YEAR - 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 | 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 Engineering of Polymers and Composite Materials W | 3.5

MECH 478 Biomaterials F | 3.5

MECH 479 NOT OFFERED THIS YEAR - Nano-Structured Materials F | 3.5

MECH 480 Airplane Aerodynamics and Performance W | 3.5

MECH 481 Wind Energy F | 3.5

MECH 482 Noise Control W | 3.5

MECH 483 Nuclear Materials W | 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 NOT OFFERED THIS YEAR - 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 OL | K3.5

MNTC P01 Engineering Mathematics W | 3

MNTC P02 Mining Geology W | 3

MNTC P03 Foundational Mathematics F | 3

MNTC P04 Calculus W | 3

MNTC P05 Foundational Physics W | 3

MNTC P06 Foundational Chemistry F | 3

MNTC 301 Technical Writing and Communications F/W/S/OL | 3

MNTC 302 Engineering Physics F/W/S/OL | 3

MNTC 303 Engineering Chemistry F/W/S/OL | 3

MNTC 304 Applied Metrology and Data Analysis W/S/OL | 3

MNTC 305 Introduction to Mining and Mineral Processing F/W/S/OL | 3

MNTC 306 Mineral Processing Unit Operations W/S/OL | 3

MNTC 307 Geomechanics and Ground Control W/S/OL | 3

MNTC 308 Safety and Occupational Health W/S/OL | 3

MNTC 309 Engineering Economics F/W/S/OL | 3

MNTC 310 Mining and Society W/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 399 Field School I (Kingston) S/OL | 3.5

MNTC 413 Surface Mine Design W/S/OL | 3

MNTC 414 Underground Mine Design S/OL | 3

MNTC 415 Metallurgical Techniques S/OL | 3

MNTC 416 Mine Services I: Ventilation and Hydraulics F/W/S/OL | 3

MNTC 417 Mine Services II: Power, Communications and Compressed Air F/W/S/OL | 3

MNTC 418 Mining Sustainability and the Environment S/OL | 3

MNTC 419 Mine Supervision and Project Management S | 3

MNTC 420 Mine Mechanization and Maintenance S/OL | 3

MNTC 421 Organizational Behaviour and Human Resources F/W/S/OL | 3

MNTC 422 Soft Rock Mining and Processing F/W/S/OL | 3

MNTC 423 Geomatics F/W/S/OL | 3

MNTC 424 Capstone Project F/W/S/OL | 3

MNTC 499 Field School II (Timmins) S/OL | 3.5

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 | 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

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 THIS YEAR - Introduction to Coding Theory F | 3

MTHE 418 Number Theory and Cryptography F | 3

MTHE 430 Modern Control Theory F | 4

MTHE 434 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

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

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> as well as the Faculty web site at <http://www.appsci.queensu.ca>. The information is also available in the Guide to Registration and Fees, which is

mailed to all new incoming students during the Summer. This publication also contains information on Registration, Payment Methods, Fee Adjustments and much more. 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	\$	25
Chemical Engineering ¹		150
Civil Engineering		50
Engineering Chemistry		150
Geological Engineering ²		1,055
Mechanical Engineering		50
Mining Engineering ³		650

¹See the Chemical Engineering and Engineering Chemistry Academic Plan section of this calendar for a breakdown and explanation of costs.

²See the Geological Engineering Academic Plan section of this calendar for a breakdown and explanation of costs.

³To be confirmed prior to start of the 2015-16 Fall term.

Non-compulsory Fees

Academic Appeal Fee will be refunded if appeal is granted.	\$40.00	payable through Student Services
Challenge (Qualifying) Examinations Fee will be refunded upon successful completion of the examination.	250.00	payable through SOLUS
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
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

Exam Rereads Fee will be refunded if the mark increases.	50.00	payable through Student Services
Internship Program - application fee	35.00	payable through Student Services
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
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
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
Section 900 or Rewrite Exam - remote exam admin fee ³	75.00	payable through Student Services

¹2015/16 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 2016 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.

Calculators are divided into three classes.

1. *Communicating Calculators*: These are never permitted in examinations.
2. *Non-Communicating Calculators with text storage and/or graphing capability and/or longterm memory*: Instructors may permit the use of these calculators in examinations but only if students are also permitted to bring "significant amounts" of written material to offset the advantage that otherwise accrues to those with fancy calculators. To be used in an examination, such a calculator must carry a "red sticker".
3. *non-communicating calculators without the features mentioned above*: Instructors may permit the use of such calculators in any examination. To be used in an examination, such a calculator must carry a "gold or blue sticker", with the exception of the very common Casio 991 model, which may be used without a sticker.

NOTE: 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. Students who received a sticker prior to September 2012 will still be able to use the calculator with the sticker.

The examination Proctors will also be told which class of calculator is to be permitted. Students bringing unauthorized or unmarked calculators into an examination may be charged with Academic Integrity (refer to Senate and University-wide Policies).

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 two weeks 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 Science (B.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 for the previous Engineering Session (fall and winter terms) 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, 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, 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.

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